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Potential for Capacity Creation in the Hazardous Waste Management Service Industry

Foster D. Snell, Inc.

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POTENTIAL FOR CAPACITY CREATION IN THE HAZARDOUS WASTE MANAGEMENT SERVICE INDUSTRY

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This report examines the economic and financial structure of the hazardous waste management service industry and its potential for creating new capacity under regulatory and non-regulatory assumptions. Hazardous waste management facilities store, treat and dispose of wastes in facilities not associated with the industries that generate the waste. An analysis of the industry structure and organization including data on types of firms and plants, employment, pricing and costing, and markets was performed. An assessment was made of the industry's financial profile for earnings, cash flow, assests, investment, and other financial indicators. In 1975, there were approximately 95 firms in the industry operating 110 facilities; total industry revenues were about $100 million. The report projects that there will be capacity shortfalls of hazardous waste management facilities in 1983 for organic chemical and metal/metal finishing potentially hazardous wastes.

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EXECUTIVE SUMMARY

This report presents an assessment of the current hazardous waste management service industry and the industry's potential for expansion. The analysis was performed for the Office of Solid Waste Management Program's Hazardous Waste Management Division of the United States Environmental Protection Agency (EPA) under contract No. 68-01-3266 by Foster D. Snell, Inc. (Snell) a division of Booz, Allen & Hamilton, Inc.

A variety of factors are acting to increase the demand for hazardous waste management services; they include:

- Imposition of air and water pollution control and land disposal regulations
- Industrial growth
- Pesticide controls
- New restrictions on ocean dumping of wastes

The increased demand may overtax the capacity of the existing hazardous waste management industry. EPA required an assessment of the industry's ability to meet the projected demand for hazardous waste treatment and disposal services in order to evaluate any potential impact of a regulatory program.

The Hazardous Waste Management Industry is young, small, fragmented and growing. It is not well defined or known outside environmental agencies or industrial sectors. In 1975, there were approximately 95 active firms in the industry operating 110 facilities. Forty percent of the facilities are owned by tightly held private corporations, 15 percent of the facilities are owned by large common stock corporations and 28 percent of the facilities are owned and operated by subsidiaries of common stock corporations. The common stock corporations and subsidiaries control 65 to 70 percent of the industry's revenues. Geographically, the industry's facilities are concentrated in industrial regions; EPA Region V has 25 percent of the nation's sites.

The overall storage, treatment and disposal capacity of the industry is approximately 7.3 million metric tons on a wet (with water) basis per year (1974-1975). However, some of this capacity represents processes which may not be considered environmentally adequate in the future; that is, the process may not treat or contain the waste to the degree necessary to prevent environmental contamination. For example, the disposal of hazardous wastes in selected areas of sanitary landfills may not contain the hazardous waste over time, particularly if chemical reactions take place which change the hazardous material into a water soluble form. Currently, sanitary landfills, deep well disposal and ocean dumping are in use and in some cases officially approved methods for disposal of hazardous wastes. For the purpose of this report, the above methods were excluded; the remaining processes, such as incineration, chemical fixation, use of secure landfills and others were considered environmentally adequate and capacity estimates were developed from only the estimates of the environmentally adequate capacity. Using this definition the environmentally adequate capacity in 1975 was 5.3 million metric tons per year -- wet basis.

Approximately 53 percent of overall industry capacity is currently used. Seventy-two percent of the respondents interviewed in this survey reported that the reason for low industry-wide capacity utilization was poor regulation or poor enforcement of standards on waste producers and hazardous waste management services. Lack of good regulation permits environmentally inadequate disposal, such as disposal of hazardous wastes in open dumps or sanitary landfills. The hazardous waste management industry, which attempts to treat and dispose of wastes, cannot compete in price with environmentally inadequate practices.

Total employment within the industry was approximately 2,000 persons in 1975. Eleven percent of employees were professionals, primarily chemists and chemical engineers. Most firms have internal training practices to develop expertise. Union involvement is small with only one in five firms having labor organizations. The average hourly wages for non-management personnel in the industry range between $5.00 and $6.50 per hour.

Prices for treatment and disposal services are fairly uniform within the industry. Transportation costs, which were not included in this study, are the major factor in pricing. Transportation costs also limit the competitive market area serviced.

Total industry revenues in 1975 were about $100 million; five firms in the industry control one-third of the revenues. The industry's annual revenue growth rate has been 14 percent for the last five years but the major industry growth in volume (quantity of wastes treated and disposed) was between 1971 and 1973. The sales and profits have remained relatively constant since 1973. An estimated 17 percent of the companies in the industry are losing money and the majority of the smaller firms have a poor (two-thirds debt) capital structure.

Industry representatives currently consider the industry's future growth potential as being strongly affected by new state or federal regulation. The study examined with and without regulation cases for the years 1974-1975, 1977 and 1983. These years were selected so that the report would correspond to the times water quality standards increase. Hazardous waste management industry representatives currently believe water effluent limitations will have the most significant impact on demand for the industry's services.

Two factors are critical to any analysis of industry growth; they are the quantity of hazardous wastes generated and the part of this quantity which is treated and disposed by the hazardous waste management industry. For the three years studied in this report, quantitites are:

Year	Estimated Total U.S. Hazardous Wastes Generated (Millions of wet (2) metric tons/year)	Estimated Demand For Hazardous Waste Management Industry (1) (Millions of wet (2) metric tons/year)
1974	40.2	7.5
1977	45.8	7.9
1983	51.7	8.9

---

(1) Quantity of wastes available for treatment and disposal by the hazardous waste management industry

(2) Includes weight of water

Note: Assumes regulations

Source: Foster D. Snell, Inc.

The results of the hazardous waste management industry assessment for 1983 are summarized below:

Item	Without Regulation	With Regulation
U.S. Demand[1] (million metric tons per year wet[2])	4.5	8.9
Number of Companies	75 to 85	90 to 100
Number of Facilities	130 to 140	160 to 170
Capacity Required to Meet Demand on an EPA Regional Basis (million metric tons per year -- wet)	5	11.0 (12 with 10% excess)
Forecasted Capacity by EPA Regional Basis (million metric tons per year -- wet)	8.3	9.1
Revenues (1975 dollars in millions)	$150 to $160	$330 to $350
Employment (number)	2,100	4,500
Tangible Assets (dollars in millions)	$150	$400 to $500

---

(1) Quantity of wastes available for treatment and disposal to outside contractors

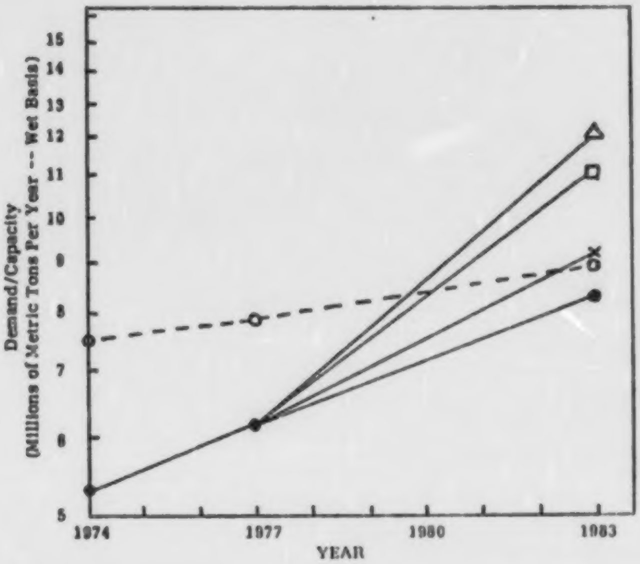
(2) Includes water weight

Source: Foster D. Snell, Inc.

The above table also illustrates the current overcapacity conditions in some areas of the U.S., such as Region X (i.e. 11 million metric wet tons capacity is necessary for the U.S. on a regional basis to meet the total U.S. demand of 8.9 million metric tons (wet basis).

With regulation, the estimated total expenditures required for the industry to essentially double capacity and meet demand is approximately $610 million by 1983. Ten percent excess capacity has been included in the estimate to provide for contingencies, such as maintenance and breakdowns. It is also assumed in this estimate that the industry will make maximum use of existing facilities and continue current practices of using second hand equipment, such as storage tanks, piping, etc. wherever possible.

However, the industry has a capital availability problem. Based on the interviews, the contractor estimates that the industry can furnish only $400 million of the needed capital from 1977 to 1983 -- assuming no hazardous waste regulations are adopted and no industry action taken until 1977. Assuming that the industry uses $100 million to upgrade existing facilities and the remainder for additional capacity, the contractor estimates that the industry can supply capacity to treat and dispose of 9.1 million metric tons of hazardous wastes per year or approximately 75 percent of the needed total capacity and excess required if new Federal, state or local regulations are imposed. These estimates are shown graphically below:



Key:

- ○ Demand -- Amount of Hazardous Waste Available to Outside Contractors
- □ Environmentally Adequate Capacity Necessary to Meet 1983 Hazardous Waste Load Demand (1983) On A Regional Basis
- △ Environmentally Adequate Capacity Necessary To Meet 1983 Hazardous Waste Load Demand (1983) On A Regional Basis Assuming 10 Percent Excess
- ● Forecasted Environmentally Adequate Capacity Without Regulation (5 Percent Annual Growth Rate)
- X Forecasted Environmentally Adequate Capacity With Regulation

Source: Foster D. Snell, Inc. analysis.

Under these conditions, and based on interviews with representatives of hazardous waste producers and those in the service industry responsible for treatment and disposal, the contractor estimates that hazardous waste producers will treat the remaining 10 percent to 20 percent of wastes in-house. The contractor further forecasts that hazardous waste generators will be able to assume the responsibility of these wastes and capabilities of environmentally adequate treatment and disposal capacity available would not significantly affect implementation of hazardous waste management regulation.

I. INTRODUCTION

I. INTRODUCTION

This report presents an economic and financial assessment of the current hazardous waste management service industry and the industry's potential for expansion. The analysis was performed for the Office of Solid Waste Management Program's Hazardous Waste Management Division of the United States Environmental Protection Agency (EPA) under Contract No. 68-01-3266 by Foster D. Snell, Inc. (Snell), a division of Booz, Allen & Hamilton, Inc.

In the past few years, EPA has been evaluating the handling, treatment, and disposal of hazardous wastes. The EPA's effort, conducted by the Hazardous Waste Management Division (HWMD), Office of Solid Waste Management Programs, has included:

- Identification of hazardous wastes
- Assessments of environmental impact
- Methods of hazardous waste control
- Requirements for waste control facilities resulting from imposition of control standards
- Means of assuring the availability of adequate facilities for control of hazardous waste.

Results of this research have indicated the requirements for environmentally safe control, treatment, and disposal of hazardous wastes. Demand for environmentally adequate treatment and disposal facilities is anticipated to sharply increase as a result of specific regulatory action in future periods, such as water quality standards. To assure the availability of treatment/disposal facilities, EPA required an assessment of the ability of the hazardous waste management service industry to expand to meet the projected demands.

Currently, this industry is characterized by involvement both in reprocessing/recovery of selected wastes, treatment, and ultimate disposal (as land disposal) of potentially hazardous wastes.

The type of services offered by the hazardous waste management industry are necessary to meet the projected demands of future hazardous waste volumes. The ability of the hazardous waste management industry to expand had to be defined. Since the hazardous waste service industry operates in the private sector, the attitude of the financial community towards such high risk enterprise is a major factor controlling the ability to expand. Therefore, the EPA required an assessment of the economic structure and organization of the industry and its economic expansion potential.

The purpose of this report is to:

- Provide 1975 baseline hazardous waste management industry data and assessment of the industry.
- Assess the ability of the industry to meet growth requirements to 1983.
- Identify the key issues and constraints affecting capacity creation by 1983.

All forecasts are based on treatment and disposal of wastes in an "environmentally adequate" manner. These processes were defined by EPA for the purposes of this study as including chemical treatment, incineration and secure landfill, but excluding land dumping, most sanitary landfills, ocean dumping and deep well injection.

In summary, this report provides an assessment of the commercial attractiveness of the future hazardous waste treatment and disposal industry and estimates the resources, capabilities and constraints of the current industry to meet the projected demand. The scope of the study included interviews with:

- Members of the current Hazardous Waste Management Industry
- The Industry Association (National Solid Waste Management Association)
- Potential new competitors
- Equipment and material suppliers to the industry
- Regulatory agencies

The time period covered in the study was from 1974 to approximately 1983.

This assignment was initiated in July, 1975 and completed over a twelve month period. The methodology consisted of an analysis of pertinent literature, supplemented with telephone and personal interviews. The following tasks were performed.

- Initial interviews with the EPA
- Assembly, review and analysis of information on the current practices and projected changes of factors affecting the hazardous waste management industry -- a list of references is presented at the end of this report.
- Development and government approval (OMB Clearance No. 158S-75016) of interview guides.
- Interviews (by telephone and in person) with representatives of the hazardous waste management service industry. Approximately 80% of the industry was surveyed. This survey consisted of 21 site visits and 62 telephone interviews.
- Compilation of an industry historical financial analysis and assessment of the current industry.
- Forecasting the growth demand on the industry and the potential for capacity creation.

The organization of the report follows the outline of tasks performed:

- Hazardous Waste Management Service Industry: Industry Profile
- Hazardous Waste Management Service Industry: Growth Potential
- Discussion

Included in the Appendix is a Glossary, Interview Guide, and List of Interviews.

II. HAZARDOUS WASTE MANAGEMENT SERVICE INDUSTRY: INDUSTRY PROFILE

1. TYPES OF FIRMS OFFERING HAZARDOUS WASTE MANAGEMENT SERVICES

The hazardous waste management service industry is composed of a variety of firms varying in size from a family-owned company having only three employees to a common stock corporation having multi-divisions. The majority of firms are privately-owned corporations with sales less than two million dollars per year; the three largest firms are multi-site operations which collectively are responsible for approximately 25 percent of the total industry's revenues. Geographically, about 60 percent of the industry's plant sites are concentrated in EPA Regions II, V and IX. Important characteristics of the industry are presented in more detail in the following paragraphs.

1.1 Ownership Configuration and Number of Sites

In 1975, the hazardous waste management industry was comprised of 95 firms with 110 sites in the United States. Approximately 94% of the companies had only one site engaged in hazardous waste management. The three largest firms of the industry have three to six sites per company handling hazardous wastes.

The ownership of firms within the hazardous waste management industry can be classified into the following categories:

- Common stock corporations
- Subsidiary or division of parent company
- Private corporation
- Partnership or family operated company
- Municipally controlled

Of the 110 sites in the U.S. in 1975, 54 were tightly held private corporations, partnerships, or family operated companies. All of these companies had a single facility. There were 46 private corporations which are tighly held with one to four owners having over 90 percent controlling interest. There were 8 family operated companies or partnerships, which typically had sales revenues less than $500,000 annually. Therefore, of the 95 companies in the industry, 57 percent were tightly held private corporations or partnerships.

There are 16 common stock corporations in the industry. Typically they have annual revenues over a million dollars. For the majority of these corporations, hazardous waste management is not their primary business.

In addition to the 16 common stock corporations, there are 31 sites that are either divisions or subsidiaries of parent corporations. Therefore, 43 percent of the total site locations are controlled through large corporations. There is a total of 32 corporations operating these 47 site locations. This segment of the industry is responsible for approximately 65 to 70 percent of the total industry revenues.

Only about 8 percent of the sites are municipally owned, these sites are concentrated in California.

1.2 Size of Facilities

The most representative classification of facility size in the hazardous waste management industry is by sales revenues generated through treatment and disposal of hazardous waste. The contractor found that volumes handled in a given year varied by type of account, material concentrations, and amount of recycled material. Therefore, hazardous waste volumes treated and disposed had more variability than sales revenues.

In 1975, the size of each individual site or facility sales revenues from hazardous waste treatment and disposal were in the following categories:

- 17 percent had sales revenues less than $100,000 per year
- 34 percent had sales revenues from $100,000 to $1,000,000 per year
- 34 percent had sales revenues from $1,000,000 to $2,000,000 per year
- 15 percent had sales revenues greater than $2,000,000 per year.

1.3 Geographic Distribution of Sites

The geographic distribution of sites was concentrated in EPA Regions II, V, and IX. These regions contain approximately 60 percent of the sites with approximately an equal proportion of facilities with revenues over two million dollars. Regions I, VIII and X were sparsely populated with sites comprising collectively only 11 percent of the total facilities. The distribution of sites offering hazardous waste management services in each of the 10 EPA regions found in the U.S. is as follows:

- EPA Region V -- 25%
- EPA Region IX -- 17%
- EPA Region II -- 16%
- EPA Region VI -- 9%
- EPA Region III -- 8%
- EPA Region VII -- 7%
- EPA Region IV -- 6%
- EPA Region I -- 6%
- EPA Region X -- 5%
- EPA Region VIII -- 1%

Table II-1 provides a comparison of the types of sites, by EPA Region, based on facility ownership, configuration and 1975 sales revenues.

TABLE II-1

HAZARDOUS WASTE MANAGEMENT FACILITIES IN THE UNITED STATES - 1975*

		Facility Ownership Configuration					Sales			
EPA Region	No. of Facilities	Common Stock Corporation	Subsidiary or Division of Parent Company	Private Corporation	Partnership or Family Operated Company	Municipally Controlled	Less than $100,000	$100,000 to $1,000,000	$1,000,000 to $2,000,000	Over $2,000,000
I	6	2	1	2	1	0	2	3	0	1
II	18	2	5	11	0	0	2	8	5	3
III	9	2	3	3	0	1	4	0	4	1
IV	7	1	2	4	0	0	1	1	3	2
V	27	4	9	13	1	0	3	8	11	5
VI	10	1	4	3	2	0	2	4	3	1
VII	8	1	2	3	2	0	2	3	1	2
VIII	1	0	1	0	0	0	0	0	1	0
IX	19	2	2	6	1	8	3	7	7	2
X	5	1	2	1	1	0	0	3	2	0
Total	110	16	31	46	8	9	19	37	37	17

---

* Facilities listed are those offering hazardous waste management services to the public and processing wastes in an "environmentally adequate" manner -- the listing excludes, however, operations using sanitary landfills.

Source: Foster D. Snell, Inc. Industry Interviews and Company Financial Statements

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2. HAZARDOUS WASTE MANAGEMENT INDUSTRY CAPACITY

Hazardous waste management firms provide a variety of services to customers in their own states and other states. Available capacity by state and by process is shown in Table II-2. The reported capacities in the Table may exceed hazardous waste generation within the state, indicating an interstate business by firm, or indicating excess or underutilized capacity. Users of this data should be cautioned that new facilities in one state will affect neighboring states. The Table also shows the percent utilizations of this capacity by EPA region. A 53% utilization is the national average.

Capacity data presented in Table II-2 is in gallons per day. This is the most commonly used capacity and can be converted to other capacity figures as required. Capacities in dry weights can be misleading, since there are often chemical reactions that take place converting material into end products that are either lighter or heavier than the original hazardous waste. For example, sulfuric acid (formula weight 98) can be reacted with lime (formula weight 56) to form calcium sulfate (formula weight 136). In addition, capacities of landfills can vary depending on how long a company wants to utilize such a facility. For example, 100,000 gallons per day for 20 years could also be 200,000 gallons per day for 10 years. Landfill capacities in Table II-2 were based on what the individual firms reported as current operating capacities.

Table II-2 also shows that many of the hazardous waste management facilities have some form of resource recovery. To the extent possible, revenues and expenses of resource recovery operations have been deleted from all cost and price estimates in this report (however, they are included in the financial history of the companies). It is important to note that resource recovery operations are a major source of revenue for the industry and form a key link in the treatment and disposal of industrial waste. Recovery operations generally account for less than 20 percent of the waste volume; however, depending on the price of the material to be recovered, the recovery operation could account for 40 percent of revenues.

Facility utilization by state by process showed no specific trends. The following were the range of utilization by process.

- Chemical treatment -- 40% to 80% utilization
- Incineration -- 30% to 80% utilization
- Secure Landfill -- 30% to 80% utilization
- Deepwell injection -- 75% utilization
- Resource recovery -- 50% to 75% utilization

TABLE II-2

ESTIMATED PROCESS CAPACITY OF THE HAZARDOUS WASTE MANAGEMENT INDUSTRY - 1974

(Thousands of Gallons per 24 Hour Day)

EPA Region	Chemical Treatment	Incineration	Secure Landfill	Deep Well Injection	Resource Recovery
Region I					
Maine	-	-	-	-	5
Mass.	46	4	4	-	4
Subtotal	46 (45%)*	4 (30%)*	4 (30%)*		9 (50%)*
Region II					
New York	45	108	190	-	17
New Jersey	26	45	49	-	40
Subtotal	71 (50%)	153 (50%)	239 (50%)		57 (60%)
Region III					
Maryland	30	10	5	-	5
Virginia	-	15	5	-	-
Pennsylvania	235	10	5	-	10
Subtotal	265 (45%)	35 (75%)	15 (30%)		15 (50%)
Region IV					
Kentucky	-	15	23	-	-
North Carolina	-	20	-	-	-
Tennessee	-	9	-	-	-
Georgia	20	-	23	-	-
Subtotal	20 (60%)	44 (60%)	46 (40%)		
Region V					
Michigan	470	80	20	-	25
Illinois	400	75	35	-	30
Minnesota	-	16	-	-	-
Ohio	485	150	120	100	45
Wisconsin	25	-	5	-	20
Indiana	150	40	50	-	195
Subtotal	1,530 (50%)	361 (65%)	230 (50%)	100 (75%)	315 (50%)
Region VI					
Oklahoma	5	-	10	20	-
Texas	65	60	125	775	230
Subtotal	70 (40%)	60 (40%)	135 (50%)	795 (75%)	230 (60%)
Region VII					
Missouri	250	5	66	-	50
Subtotal	250 (50%)	5 (75%)	66 (60%)		50 (60%)

TABLE II-2 (2)

EPA Region	Chemical Treatment	Incineration	Secure Landfill	Deep Well Injection	Resource Recovery
Region IX					
California	57	14	639	-	400
Subtotal	57 (80%)	14 (80%)	639 (80%)		400 (75%)
Region X					
Washington	28	-	125	-	405
Idaho	-	-	200	-	-
Subtotal	28 (50%)		325 (30%)		405 (60%)
TOTAL	2,337	676	1,714	895	1,481

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* Estimated 1974 capacity utilization

Note: The weighted average capacity utilization of chemical treatment, incineration, and secure landfill of the hazardous waste management industry was 53% in 1974.

Source: Foster D. Snell, Inc. industry interviews

The highest utilizations were in Region IX for all processes, with lowest utilizations in Region I. In Region I, hazardous waste management facilities were not being utilized to capacity because of price competition from other EPA regions. In Region IX, capacity is being utilized at a high rate due to two major factors.

- Enforcement of the treatment and disposal of hazardous wastes is strict and uniform.
- Siting problems for raw hazardous waste management facilities have restricted capacity.

3. MARKETS OF THE HAZARDOUS WASTE MANAGEMENT SERVICE INDUSTRY

3.1 Overall Demand

The EPA has identified 13 industry groupings which are major generators of hazardous wastes. These 13 industries are not the only sources of hazardous wastes, therefore the market analysis must be considered as minimum. The metals mining industry does not utilize outside contractors to treat or dispose of hazardous wastes and is not included in the market analysis. The 12 other industries generated an estimated 40.2 million metric tons of potentially hazardous wastes per year in 1974 (wet basis - with water). Approximately 81 percent, or 32.7 million metric tons, of these wastes are reported to be treated and disposed internally by the generating industries. Table II-3 presents the EPA industry groupings, together with 1974 estimated waste loads and quantities available for outside contract.

3.2 Hazardous Waste Management Industry Categorization of Markets

The hazardous waste management industry views the 13 EPA groupings in terms of the wastes produced and the general types of treatment and disposal required to manage the wastes. The hazardous waste management industry generally uses the following five categories to describe waste markets.

- Metals/Metal Finishing
- Paints/Solvents/Coatings
- Organics
- Petroleum
- Inorganics

Table II-4 presents the five categories and an estimate of the input to each category from the 13 EPA industry groupings. The general types of processes used for treatment are also included.

3.3 Hazardous Waste Management Industry Capacity by Type of Market

Section 2 presented hazardous waste management capacity and utilization segmented by process. This section presents the same information segmented by market. The estimated capacities are presented in the five market categories by region on a wet basis, since the conventional industry terminology is on a liquid throughput basis.

TABLE II-3

MARKETS FOR HAZARDOUS WASTE MANAGEMENT SERVICES - 1974

(Millions of Metric Tons per Year)

Industry	SIC Codes	Estimated Hazardous Wastes Produced		Estimated Hazardous Wastes Available For Outside Contract		Percent of Hazardous Waste Generation Available For Outside Contract
		Dry*	Wet*	Dry*	Wet*	
Batteries(1)	3691, 3692	0.005	0.010	0.003	0.006	65%
Inorganic Chemicals(2)	281	2.000	3.400	0.300	0.510	15
Organic Chemicals, Pesticides and Explosives(3)	2681, 2865, 2869, 2879, 2892	2.150	6.860	0.430	1.372	20
Electroplating(4)	3471	0.909	5.276	0.636	3.693	70
Paint and Allied Products(5)	285	0.075	0.096	0.071	0.091	95
Petroleum Refining(6)	291	0.610	1.300	0.366	0.780	60
Pharmaceuticals(7)	283	0.062	0.065	0.053	0.055	85
Primary Metals Smelting and Refining(8)	3312, 3313, 332, 3331, 3332, 3333, 3334, 3339, 33412, 33417	17.398	20.356	0.348	0.407	2
Plastics(9)	2821, 2822, 2823, 2824	0.151	0.737	0.031	0.147	20
Rubber(9)	3011, 3021, 3031, 3069	0.048	0.048	0.046	0.046	95
Leather Tanning and Finishing(10)	311	0.045	0.146	0.043	0.139	95
Special Machinery(11)	355, 357	0.102	0.163	0.097	0.155	95
Textiles, Dyeing, and Finishing(12)	22	0.048	1.770	0.012	0.098	5.5
TOTAL		23.603	40.227	2.445	7.499	19%+

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* "Dry" does not include weight of water; "wet" includes water weight.

+ Weighted average of hazardous waste available for outside contract on a wet basis.

Sources: (on next page)

Sources With EPA Contract Numbers:

(1) Versar, Inc., "Assessment of Industrial Hazardous Waste Practices: Storage and Primary Battery Industries," Contract No. 68-01-2276.

(2) Versar, Inc., "Assessment of Industrial Hazardous Waste Practices, Inorganic Chemical Industry". Contract No. 68-01-2246.

(3) TRW Inc., "Assessment of Industrial Hazardous Waste Practices, Organic Chemicals, Pesticides, and Explosives Industries", Contract No. 68-01-2919.

(4) Battelle, Columbus Laboratories, "Assessment of Industrial Hazardous Waste Practices - Electroplating and Metal Finishing Industries", Contract No. 68-01-2664.

(5) Wapora Inc., "Assessment of Industrial Hazardous Waste Practices, Paints Industry", Contract No. 68-01-2656.

(6) Jacobs Engineering Co., "Assessment of Industrial Hazardous Waste Practices, Petroleum Refining", Contract No. 68-01-2288

(7) Arthur D. Little, Inc., "Hazardous Waste Generation, Treatment and Disposal in the Pharmaceutical Industry", Contract No. 68-01-2684.

(8) Calspan Corporation, "Assessment of Industrial Hazardous Waste Practices in the Metal Smelting and Refining Industry", Contract No. 68-01-2604.

(9) Foster D. Snell, Inc., "Assessment of Industrial Hazardous Waste Practices, Rubber and Plastics Industry", Contract No. 68-01-3194.

(10) SCS Engineers, Inc., "Assessment of Industrial Hazardous Waste Practices -- Leather Tanning and Finishing Industry", Contract No. 68-01-3261.

(11) Wapora Inc., "Assessment of Industrial Hazardous Waste Practices, Special Machinery and Manufacturing", EPA Contract No. 68-01-3193.

(12) Versar, Inc., "Assessment of Industrial Hazardous Waste Practices, Textiles Industry", Contract No. 68-01-3176.

TABLE II-4

MARKET STRUCTURE OF THE HAZARDOUS WASTE MANAGEMENT INDUSTRY - 1975

Market Category	Estimated Input From Each EPA Industry Group		Types of Hazardous Wastes	Current Treatment Methods
	Group	Percent*		
Metals/Metal Finishing	- Batteries	< 5%	Acid solutions Metals containing sludges	Neutralization Chemical Treatment Sanitary Landfill Secure Landfill Deep Well Injection Ocean Disposal
	- Electroplating	80 - 90		
	- Primary metals smelting and refining	10		
	- Special machinery	3 - 7		
Paints/Solvents/ Coatings	- Paint and allied products	100	Organics Solvents	Incineration Chemical Treatment Sanitary Landfill Secure Landfill
Organics	- Organic chemicals	80 - 90	Pesticides Biologicals Rubber Plastics	Incineration Biological Treatment Chemical Treatment Sanitary Landfill Secure Landfill
	- Pharmaceuticals	3 - 5		
	- Rubber and plastics	8 - 12		
	- Textiles, dyeing, and finishing	5		
Petroleum	- Petroleum Refining	100	Oily wastes	Incineration Deep Well Injection
Inorganics	- Inorganic chemicals	80 - 90	Aqueous solutions of salts, metals, etc.	Chemical treatment Ocean Dumping Secure Landfill
	- Leather tanning	10 - 20		

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* Weighted % of category

Source: Foster D. Snell, Inc. analysis based on industry interviews.

It must be emphasized that capacity calculations by market are relative values, since the hazardous waste management facility serves a variety of clients. For example, a plant with an incinerator might process paint sludges one day and refinery wastes the next. Heavy metals may come from a metal plating process one day and a metal smelting and refining process the next. Organic pesticide residues, pharmaceutical wastes and waste rubber and plastic matter containing unreacted toxic monomers could be handled by the same plant. The estimates given are total overall capacities for given waste types. In most instances, plants do not operate at capacity. The overall capacity for the industry is the additive capacity for end market area at this point in time; however, the capacity is a variable to waste concentrations and types of materials disposed.

The current (1974) capacity estimates for the hazardous waste management industry include some processes which may not be environmentally adequate in the future. For example, EPA anticipates that deep well injection will not be considered environmentally adequate in future periods. Currently, however, these practices are used and in some cases approved by local regulatory agencies. Capacity estimates given in this section include facilities which may not be used in the future, but currently have some form of approval, such as a sanitary landfill which has a permit to accept some hazardous wastes and fill these wastes in a segregated area. (Later chapters in this report provide capacity estimates of environmentally adequate capacity.)

The current capacity of the hazardous waste management industry is approximately 7.1 million gallons per day or 1.8 billion gallons per year (24 hour operation, 250 days per year). Disposal of petroleum wastes (by deep well injection, for example), which occurs predominantly in Regions V, VI, IX, and X accounts for 43 percent of hazardous waste/treatment and disposal capacity. Table II-5 presents the capacity estimates for the 10 EPA regions by market. It is evident that capacity follows market as discussed in the following paragraphs.

3.3.1 Paint/Solvents/Coatings

The largest waste treatment and disposal capacity exists in Regions II and V indicating the concentration of paint and coating manufacturers (Region II) and paint and coating users (Region V). Both represent areas of maximum industrial concentration.

TABLE II-5

ESTIMATED HAZARDOUS WASTE MANAGEMENT INDUSTRY CAPACITY -- 1974 (1)

(Thousands of Gallons Per 24 Hour Day)

	MARKET				
EPA REGION	Paints/ Solvents/ Coatings	Metal/ Metal Finishing	Organic	Petroleum	Inorganics
I	8	--	4	5	46
II	220	75	110	20	95
III	45	130	15	30	115
IV	50	25	15	15	5
V	275	1,210	166	770	415
VI	35	70	25	1,085	65
VII	20	125	56	20	150
VIII	3	3	3	3	3
IX	30	105	65	640	180
X	50	55	55	550	55
TOTAL	736	1,798	550	3,138	1,129

Note: (1) Includes deep well injection, approved sanitary landfill and other processes which were used in 1974, but may not be considered environmentally adequate in future periods.

Source: Foster D. Snell, Inc.

3.3.2 Metals/Metal Finishing

Region V had the highest capacity for processing hazardous wastes in the metals and metal finishing market. This is primarily due to the concentration of the automotive and steel industries in the midwest.

3.3.3 Organics

The ability to handle and process high organics is spread broadly across all 10 EPA Regions with Regions II and V having the total maximum capacity.

3.3.4 Petroleum

Approximately one-third of the hazardous waste management industry's capacity for petroleum wastes is concentrated in EPA Region VI. EPA Regions V, IX, and X additionally contain significant hazardous waste management industry capacity. The distribution of hazardous waste management capacity indicates the regional concentration of the petroleum industry.

3.3.5 Inorganics

The distribution of capacity to handle conventional inorganic hazardous wastes is broad except for a concentration in Region V due primarily to the industrial concentration of the Region.

4. EMPLOYMENT IN THE HAZARDOUS WASTE MANAGEMENT INDUSTRY

Total employment in the hazardous waste management industry was about 2,000 employees in 1975. The industry is labor intensive with annual revenues of approximately $50,000/employee. The key employment characteristics are presented in the following paragraphs.

4.1 Skill Level of Employment

In 1975, there were an estimated 2,000 employees actively engaged in the hazardous waste industry. Approximately 11 percent of the employees are classified as professionals. Of the professional employees, 75 percent are chemists or chemical engineers. Larger firms with sales over two million dollars per year have the highest percentage of professionals with a chemical background; in some of the leading firms in the industry 100 percent of the professionals have chemical backgrounds (including sales personnel). Of the other 25 percent of the professionals, the majority is composed of employees with business backgrounds who are engaged in sales, accounting and management.

The breakdown of skilled versus unskilled employees within the industry is difficult to define because of the following factors:

- The contractor's definition of a skilled employee is a chemical operator or technician requiring skills to operate specific waste treatment equipment or conduct specific laboratory analysis.

- Employees engaged in operation of such equipment as trucks, heavy machinery, etc., are not classified as skilled; however, their wages are higher than "skilled" employees.

- The industry in general trains operations personnel internally in the corporations; hence operations personnel having skilled titles may have relatively minor experience with waste treatment equipment. The industry is labor intensive in drum handling and transferring. Although the skills required in these operations is minimal, some classify "material handlers" as skilled.

4.2 Labor Organizations

Union involvement in the hazardous waste treatment industry is minimal with only one in five firms having labor organizations. The union activity is concentrated in firms with larger revenues and corporations with hazardous waste divisions. No one union dominates the activity in the industry. The following unions are involved in the industry: International Brotherhood of Teamsters, International Chemical Workers Union, United Steelworkers of America.

4.3 Productivity Incentives

None of the companies interviewed had any type of productivity measurement incentive built into the hourly wage. Corporate profit sharing measures were built into employee wages in approximately 10 percent of the firms interviewed; none of the firms with profit sharing had union involvement. Of the firms offering profit sharing to employees, actual revenues distributed to employees was negligible, as the majority of firms have operated at a loss or breakeven basis in recent years.

4.4 Average Wage and Fringe

The mean hourly wage in the industry was $5.80. Company fringe benefits averaged 25 percent to 30 percent of the hourly wage and are not included in the average wage. This standard was uniform for the industry except for Michigan where the cost was at 50 percent of the hourly wage. The fringes offered in Michigan are competitive with other industries such as the automotive industry.

The average hourly wage in different regions was quite uniform remaining between $5.00 and $6.50. EPA Region IV had the lowest hourly wage at approximately $4.75 per hour, while Region IX had the highest wage rate at $8.25 per hour.

4.5 Employee Training

Of the firms interviewed,80 to 90 percent had set up internal on-the-job training programs for new personnel. The employees were utilized almost immediately as material handlers, but their operations skill level in general was not established until 6 to 12 months after being employed. Skilled employees with chemical or waste treatment backgrounds were generally not available to the hazardous waste industry.

Except for laboratory technicians, maintenance crews, and heavy equipment operators, hourly employees entering the industry did not have specific skills. There is very little job transfer from company to company within the industry for the hourly employee, as most of the treatment and disposal sites are geographically separated.

Professionals entering the industry, especially in operations management, engineering, and laboratory positions, have specific chemical or environmental backgrounds. The professional turnover within the industry is reported to be approximately twenty percent annually, which is over twice the turnover rate of the chemical industry. The operations managers for a high percentage of the small firms had previous experience with some other established larger corporations in the hazardous waste management industry. The prime reason for high turnover was because the majority of companies in the industry were small and had small professional staffs -- on hiring a professional, the company wants experience in the waste treatment or disposal industry.

Tables II-6 and II-7 summarize key employment data for the hazardous waste management industry.

TABLE II-6

EMPLOYMENT IN THE HAZARDOUS WASTE INDUSTRY BY EPA REGION - 1975

EPA Region	Total Employees	Percentage Professional Employees	Average Non-Professional Wage ($/hr.)	Hazardous Waste Industry Comments
I	80 - 100	12%	$5.60	Employees trained internally, no union involvement
II	530 - 630	9%	$5.50	Adequate labor pool, train personnel internally
III	80 - 120	12%	$5.15	
IV	70 - 90	12%	$4.75	Adequate labor pool
V	440 - 520	13%	$6.60	Premium paid to workers in hazardous waste industry, skilled labor scarce -- do internal training
VI	220 - 280	13%	$5.00	Lack skilled force in good economy
VII	50 - 60	10%	$5 - $6.50 *	Lack skilled force for expansion
VIII	55 - 65	10%	$5 - $6.50 *	
IX	200 - 260	14%	$8.25	Do internal training
X	80 - 120	9%	$6.20	Problem getting trained personnel and chemical engineers
TOTAL	1,805 - 2,245	12%	$5.85	

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* Respondents classify wages as competitive to other firms within the industry.

Source: Foster D. Snell Estimates from Industry Interviews.

TABLE II-7

ESTIMATED EMPLOYMENT IN THE HAZARDOUS WASTE MANAGEMENT INDUSTRY - 1975

Hazardous Waste Revenues	No. of Employees	No. of Professional Employees	No. of Skilled Employees	No. of Unskilled Employees	Percent of Companies with Unions	Average Revenues/ Employee
More than $1 Million	1400-1500	125-175	775-875	460-510	36%	$62,000
Less than $1 Million	540- 640	60-100	160-210	300-350	12%	$36,000
Total Employment	1940-2140	185-275	935-1085	760-860	22%	$51,000

Source: Foster D. Snell, Inc. Estimates Based on Industry Interviews.

5. PRICES

Prices charged for hazardous waste management services often include a multiplicity of functions, such as transportation, storage, actual treatment and disposal. In addition, the form and content (solid, liquid, concentration, type of container, condition of container, safety aspects of handling wastes, etc.) also determine prices in most cases to a greater extent than the process used for treatment or disposal. For example, one company might transport a waste and incinerate it for a total fee of 20¢ per gallon. Another company would charge $1.50 per cubic foot for disposal of drums containing pesticides in a landfill, but the producing company would pay freight. A third example would be a company treating wastes with ultimate disposal in its own secure landfill. All of these are priced as a complete service without breakdowns for each separate function. To the extent possible, interviewees were asked to estimate prices for only the treatment and disposal process; these prices are reported in this section.

In developing representative prices, a listing of 17 services ranging from transport to incineration was used. In many cases, there was little or no price differentiation found among groups of operations. In addition, prices of selected services, such as transportation, are variable. Table II-8 presents the listing of 17 services and the reasons for inclusion or exclusion in the pricing summary information.

The prices reported by the hazardous waste management industry were for specific types of waste as chromates, cyanides, heavy metals, etc. The contractor listed the prices quoted into four basic categories of types of treatment or disposal:

- Chemical treatment and disposal
- Incineration
- Secure landfill
- Deep well injection

Variation resulting from the type of wastes treated and/or disposed are included in the price determination.

TABLE II-8

PROCESSES/PRICING IN THE HAZARDOUS WASTE MANAGEMENT SERVICE INDUSTRY

Service	Reason for Inclusion or Exclusion	Remarks
Collection and Transport	Excluded -- variable with distance to waste generator's plant.	Normally included in total service price. May be paid by generator.
Receiving and Storage	Excluded -- variable dependent on service operation.	Normally included in total service price, if service provided.
Neutralization	Included -- grouped with precipitation, chemical fixation, oxidation/reduction and flocculation/sedimentation. Companies who process inorganic wastes handle all types by a combination of processes which are not priced (or costed) separately.	Title used for group is Chemical Treatment.
Biological Treatment	Excluded -- none of the companies interviewed had a purely biological treatment for processing hazardous wastes -- the biological treatment was one step of the overall waste treatment process.	
Chemical Fixation	Included -- see neutralization	
Oxidation Reduction	Included -- see neutralization	
Flocculation Sedimentation	Included -- see neutralization	
Filtration/ Ultrafiltration	Excluded -- none of the companies interviewed used this process	
Ammonia Stripping	Excluded -- none of the companies interviewed used this process	
Carbon sorbtion	Excluded -- none of the companies interviewed used this process	

TABLE II-8 (2)

Service	Reason for Inclusion or Exclusion	Remarks
Incineration	Included	
Evaporation	Excluded — normally accomplished by waste producer, or in one case, a small part of the total treatment process.	
Secure Landfill	Included	Secure landfills only are included; however, some landfills that are secure by natural geological formations (without secure liners) are included.
Resource Recovery	Excluded -- variable depending on waste and value of recovered material.	
Deep Well Injection	Included	For purposes of this study, not considered "environmentally adequate" disposal.

Source: Industry interviews and Foster D. Snell, Inc. analysis.

5.1 Price Determination

Industry representatives report that prices for treatment/disposal are primarily a function of costs. Although selected opportunities for premium pricing occur due to strict enforcement of regulations in certain areas, the competition of dumping of the wastes forces the industry to maintain low prices. For 70 percent of the facilities, the wastes are analyzed, and the disposal price determined from a listing of overall processes and materials. The prices generally include transportation and handling. (Operating costs are discussed in a later section.)

A key factor in price determination is the actual waste content and the compatibility of the waste for use in other processes at the facility. This is normally characterized by the industry as waste-to-waste processing in which wastes from one source can be combined with wastes from another to form an environmentally acceptable waste. For example, acids can be combined with bases. In contrast, processing with purchased materials is more expensive and based heavily on the raw material costs.

5.2 Chemical Treatment

The bulk of the inorganic chemical processing of hazardous wastes occurs in Regions V, VI and VII corresponding to the concentration of metalworking and related industries, as well as steel producing facilities. In general, the following prices are representative for various types of chemical waste.

.	Acid or Base Neutralization:	\$0.06 to \$0.12 per gallon
.	Chromates:	\$0.15 to \$0.25 per gallon
.	Cyanides:	\$0.40 to \$0.50 per gallon
.	Heavy Metals:	\$0.12 to \$0.20 per gallon

The concentration of material in these aqueous solutions also affects price, but no defined standard was found.

5.3 Incineration

Incineration of hazardous wastes is practiced in all the EPA Regions except I and VIII. The cost is largely determined by the percent combustibles within the hazardous waste mixture. There is also a trend among some firms to utilize the waste heat from the incineration process to generate steam or produce heat for a resource recovery operation.

Costs are also affected by the volume of the waste and its ease of handling. Companies having incinerators complain that their customers don't always tell them what the shipment contains. Also, drums of "semi-solid" pourable material can be solid and unburnable several days after transfer. The average charge for incineration is approximately 10¢/gallon for conventional hydrocarbons and as high as $0.45 per gallon for chlorinated hydrocarbon wastes, pesticides and other materials.

5.4 Secure Landfill

Pricing for landfill services varied significantly, and were primarily based on waste type. Petroleum sludges handled by the thousands of barrels were processed at lowest unit cost, whereas drums of explosives, pesticide residues and similar materials were at the upper end of the scale. Prices for disposing of small quantities of hazardous wastes with large volumes of municipal or non-hazardous industrial wastes were also at the low end of the scale.

Prices are based on several units of measure; however, for hazardous wastes, cost per cubic foot is a common volumetric measure for utilization of landfill space.

5.5 Deep Well Injection

Deep well injection is practiced primarily in EPA Region VI because of the presence of the oil industry which is a prime producer of oil/salt water/oily acid wastes. Deep well injection was not found in California (Region IX) where landfill was the technique of choice for similar wastes. One firm in Region V utilizes deep well injection for waste steel pickle liquors, but no definitive pricing was obtained. The data, therefore, reflects pricing only in Region VI.

5.6 Price Factors

Some of the key factors reported by industry representatives relating to pricing are as follows:

- The industry cannot compete with organizations who provide environmentally inadequate services.
- Inability of hazardous waste management facilities to compete with publicly funded landfills.

- If the price of oil or solvents goes up, incinerator business disappears as the materials are recycled or burned for fuel, so prices must be kept low for this service

- Treatment is considered a fringe business as long as Federal and state agencies are watching the waste producer. The industry must keep prices low enough to encourage compliance, when waste generators are not being scrutinized by environmental agencies.

Nationally, there appear to be two parallel and conflicting pricing trends for hazardous waste management services. Some companies who offer the treatment and disposal of hazardous wastes as opposed to those only offering secure landfill disposal, see prices for hazardous waste management services constant or moving downward as more wastes are processed, i.e., volume increases yield lower overhead and operating costs. Other firms within the same regions handling similar wastes are increasing prices upwards as the demand to use acceptable treatment and disposal services increases, i.e. when unacceptable techniques of hazardous waste disposal are prohibited, the hazardous waste management industry can charge a premium.

For most wastes, however, disposal by open dumping, sanitary landfill, or deep well injection offers the lowest price. As long as these procedures are sanctioned, prices charged by the hazardous waste management industry will have to reflect these competitive pressures.

Waste generators are constantly scrutinizing their profitability. Except in instances where a company is concerned about its public image, plant personnel want the lowest cost operation, and do not appear to care about the method of waste disposal. This puts a severe constraint on the hazardous waste management industry which is attempting to handle wastes efficaciously, but must still compete.

In addition, many of the more visible waste generators have found that by virtue of the volume and complexity of their wastes, in-house treatment and disposal is the preferred method of hazardous waste management to:

- Protect the identity of their products

- Keep control of where the wastes go

- Maintain public image as an "Environmental Good Guy".

In summary, pricing in future periods was forecasted to increase at the inflationary rate of equipment and labor except in areas that have unique demand situations for hazardous waste services. The consensus of interviewees predicted a five to six percent annual increase in current prices. Because the industry is currently operating at only 50 percent of capacity, an increase in demand is not predicted to increase prices. The contractor forecasts prices to increase at a five percent annual growth rate. The supply/demand relationship for hazardous waste management services is dynamic since waste generators have the option of internally treating and disposing of hazardous wastes.

Table II-9 presents the pricing summary by EPA Region.

TABLE II-9

REPRESENTATIVE PRICES FOR HAZARDOUS WASTE MANAGEMENT SERVICES, 1975
(Dollars Per Gallon)

	Chemical Treatment of:					Incineration of:			Secure Landfill of:			Deep Well Injection of:		
EPA Region	Acid or Base Requiring Neutralization	Chromates	Cyanides	Heavy Metals	General	Primary Hydrocarbon	Chlorinated	Other	Liquid	Weight (\$/ton or drum)	Volume (\$/ft.^{3})	Hydrocarbon Based	Inorganic Based	Other
I	-	-	-	-	0,10	-	-	-	-	-	-	-	-	-
II	0,08	-	-	-	0,06-0,15	0,065-0,015(1)	-	-	-	13,50/ton	0,65-1,75	-	-	-
III	-	-	-	0,15-0,20	0,04	0,08-0,10	-	-	0,045(5)	-	0,30	-	-	-
IV	-	-	-	-	0,10	0,10-0,30	-	-	-	15,00/ton	0,75	-	-	-
V	0,11-0,20	0,10-0,16(2)	0,40	0,10-0,15(2)	0,04-0,15	0,06-0,20	0,30	0,40(3)	0,03	-	0,22-0,67	-	-	-
VI	0,09-0,12	0,20-0,30	0,48-1,50	0,17-0,20	-	0,07-0,14	-	-	-	10,00/ drum	-	0,04-0,06	0,0225	0,25
VII	0,03-0,12	-	-	-	0,10	0,10-0,20	-	-	-	5,00 - 30,00/ drum(6)	0,33-2,00	-	-	-
VIII	0,03(1)	-	-	-	-	-	-	-	0,03	-	0,22	-	-	-
IX	0,06	-	-	-	0,06-0,15	0,15	-	-	0,03	8,50/ drum	1,25-1,75	-	-	-
X	-	0,15	0,50	0,12	0,06-0,30	0,10	-	-	-	1,75/ drum	1,00	-	-	-

Notes:
(1) Bulk quantities
(2) per pound
(3) Pesticides
(4) Assume 100 ft.^{3} mixed waste is 1,5 x water weight
(5) 7,5 gal. per cubic foot
(6) per drum - 30" diameter x 36" high
(7) Selected wastes

Source: Industry Interviews by Foster D. Snell, Inc.

NOT REPRODUCIBLE

6. OPERATING COST CHARACTERISTICS -- 1975

The operating cost characteristics of firms engaged in the hazardous waste management industry vary primarily with the type of services offered and the size of the firm.

There are a number of small firms within the industry with sales revenues less than $500,000 per year, which have unique operating cost characteristics. Some of the typical characteristics of the industry noted in these firms were:

- Negligible investment in capital expenditures, including utilization of rented land and contracting out some of the treatment and disposal services offered.
- Negligible equity in the firm -- primary liabilities were short term loans and accounts payable.
- Inventory of wastes not processed, as some firms stockpiled wastes in drums until process or facility was completed or developed.

For these reasons the operating cost data developed for the industry were selected from established firms who preferably had been in operation for at least four years and had annual sales over $500,000.

Approximately 85 percent of the firms within the industry offer the collection and transportation of hazardous wastes to their facilities. The total revenues reported by the firms include these costs -- whether they are contracted out or handled internally. The collection and transport segment of the firms in the industry amounts to 20-25 percent of the industries' operating costs. These costs are not included, however, in the cost distribution analysis. The following paragraphs discuss the typical operating costs by facility. Table II-10 summarizes the operating costs.

6.1 Full Service Facility

The larger firms in the industry with annual sales typically over two million dollars offer a full service treatment facility including typically: secure landfill, incineration, chemical treatment, resource recovery, sanitary landfill, and carbon sorption. Their total operating costs amount to approximately two-thirds of sales revenues with labor and maintenance approaching 50 percent of sales, energy and material at ten percent, and depreciation at nine percent. The sales, general and administrative expenses are 17 percent of revenue with interest and insurance expense at six percent. The total net income before taxes for the full service facility typically is ten percent.

TABLE II-10

OPERATING COST CHARACTERISTICS OF HAZARDOUS WASTE MANAGEMENT FACILITIES, 1975 (1)

	Type of Waste Service at Facility				
	Full Service	Secure Landfill	Biological(2) Treatment	Chemical Treatment	Incineration
Sales Revenues (minus transportation)	100%	100%	100%	100%	100%
Less: Operating Costs					
Labor	26%	23%	18%	30%	28%
Maintenance	22	5	8	20	20
Energy	5	5	5	4	6
Materials	5	-	10	3	
Depreciation	9	37	21	10	8
Site Fees					3
Subtotal, Operating Costs	67	70	62	67	65
Gross Profit	33	30	38	34	35
Sales, General and Administration	17	10	20	18	14
Interest and Insurance	6	5	6	5	12
Subtotal, Overhead Expenses (3)	23	15	26	23	26
Net Income Before Taxes	10%	15%	12%	11%	9%

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(1) Representative operating cost data was selected from firms with the following characteristics: established in business for at least four years; total revenues primarily in hazardous waste management; annual hazardous waste revenues of $500,000 or greater.

(2) With some chemical treatment

(3) Indirect manufacturing costs

Source: Foster D. Snell, Inc. estimates based on industry interviews.

6.2 Secure Landfill

Approximately 90 percent of the privately owned (not municipally controlled) secure landfills, are part of a larger facility that offers treatment services. Some operations have hazardous waste disposal as their main objective; e.g., those catering to certain types of industries generating wastes as pesticides or radioactives. The typical cost factors for preparation of a secure landfill, having approximately one million cubic feet capacity are:

- Cost of land - depends on area of country, proximity to metropolitan area, (up to $200,000 -- may be land owned by existing waste management operation)
- Site preparation approximately $50,000 (excavation, liners, etc.)
- Purchase of one to three bulldozers depending on volume.

The major operating cost for a secure landfill is depreciation of capital investment (37 percent of total sales revenues, 54 percent of operating costs). There are minimal labor, maintenance, and energy charges, excluding the transportation segment. The sales charges are minimal, as generally land disposal services are in demand, and customers are referred to or search out these services. The secure landfill site's profits before taxes average 15 percent.

6.3 Biological Treatment Processing

The biological treatment processes studied were parts of larger sites. They were in operation exclusively for low concentration streams, having less than three percent salts.

For a biological treatment process, fixed costs (depreciation, site fees, general and administrative, and interest expense) approach 50 percent of total revenues. Materials cost is also ten percent of revenues. Being so capital intensive, labor is generally below 20 percent, maintenance below ten percent and energy at five percent of revenue.

6.4 Chemical Treatment Processing

Sites offering chemical treatment services generally had ultimate disposal at a secure landfill associated with the site to dispose of any final wastes. Most of the chemical treatment facilities were performing some resource recovery operations in addition to the treatment and disposal (such as recovery of oils or insoluble chemicals with water at different acidity). Typically, a plant's material balance would recover 2 percent to 8 percent of the incoming waste, while 5 percent to 10 percent would ultimately be sent to a secure landfill.

Labor and maintenance costs of chemical treatment processing facilities were the highest in the industry 50 percent of sales revenue. The chemical processing of wastes was generally in small batch operations which is inherently labor intensive. Materials costs, however, were only three percent, due to a blending of waste streams during neutralization. The amount of capital expenditure was low, as used equipment was installed where available in over 75 percent of the facilities.

6.5 Facilities Offering Incineration

Only 15 percent of the incinerators had scrubbing engineered into the design. About half of the incinerators in operation were operating as the primary service of the site.

Incineration labor costs were 28 percent of revenues as the sites typically did a high percentage of material transfer on-site in drums and from bulk containers.

Interest and insurance expenses amounted to 12 percent of revenues, the former is due to the large capital expenditure financed through private sources.

7. FIVE YEAR FINANCIAL HISTORY

From 1971 to 1975 the annual growth rate in the hazardous waste industry in revenues has been 14 percent; there were 25 percent more companies in the industry in 1975 than in 1971.

In 1975, the industry was dominated by five firms which had over a third of the total industry revenues. Hazardous waste sales revenues vary, by firm, from $35,000 to $12 million per year. The median sales revenue of the companies surveyed was approximately $1 million annually. In 1975, the distribution of companies by sales level of hazardous waste management was:

- $100,000 or less -- 19%
- $100,000 to $500,000 -- 21%
- $500,000 to $1,000,000 -- 15%
- $1,000,000 to $2,000,000 -- 31%
- $2,000,000 to $5,000,000 -- 10%
- $5,000,000 or greater -- 4%

Industry growth occurred primarily during the period between 1971 and 1973 when over 30 percent annual growth rate was experienced. Growth of revenues between 1973 and 1975 has been due primarily to price increases of services, not volume treated.

Although the industry's sales and profits have remained healthy over the five year period, the magnitude of capital investment and financing has deteriorated the capital availability for the industry. The industry has changed over the five year period in the following manner:

- The number of companies has grown from approximately 76 in 1971 to 95 in 1975. The two years which had the largest number of new entrants in the industry were 1972 and 1973.

- Profitability as a percent of revenues has remained healthy over the five year period. Net income as a percent of revenues has varied between 5.5 percent to 9 percent. Profits as a percent of total tangible equity (net worth) has been between 18 percent and 22 percent over the period. This data indicated that the industry has been profitable on its invested capital.

- The working capital (current assets minus current liabilities) position has declined since 1973. This decline is also reflected in the current ratio (current assets divided by current liabilities). The industry has kept a very low cash position, while its current liabilities have been growing. This poor cash flow situation is detrimental when attempting to obtain low interest rates for long term debt.

- From 1972 to 1975, the total tangible equity remained relatively stable while the industry total tangible assets have grown by 30 percent. This shows that owners have not been investing additional capital for expansion. Industry expansion has been financed through debt and investment of current period profits on sales.

- Banks were willing to extend long term loans to the industry until 1973. Since 1973, long term debt has remained stable for the industry as financial institutions have been reluctant to invest capital in the industry because: hazardous waste management firms in general did not have storing financial positions, and the growth of the industry was deemed risky in future periods.

- Short term debt financing has increased from $3.2 million in 1971 to $7.2 million in 1975. This high cost debt financing additionally points out the current problems of the industry in obtaining lower cost long-term capital.

Table II-11 presents the overall industry financial parameters for a five year period.

Firms that are active in the hazardous waste treatment industry can be classified into two basic categories: (1) firms whose main objective is hazardous waste management, and (2) divisions or sites of larger companies that are engaged in the waste management industry (example: Chem-Trol Division of SCA Services, Inc.). The financial picture of the divisions of larger firms has to be characterized separately as they do not fall under the same capital restraints as the majority of firms engaged in the industry.

TABLE II-11

FIVE YEAR FINANCIAL HISTORY OF HAZARDOUS WASTE MANAGEMENT INDUSTRY -- 1971-1975

Item	Accuracy of Estimate (+ or -)	1971	1972	1973	1974	1975
Active Number of Companies in Industry	10%	76	82	87	91	95
Industry Total Revenues (millions of dollars)	5%	$ 46	$ 65	$ 88	$ 103	$ 107
Total Net Income (millions of dollars)	10%	4.1	3.7	5.6	6.6	7.5
Total Industry Working Capital (millions of dollars)	20%	5.2	9.0	13.0	5.0	3.8
Industry Current Ratio	0.1	1.48	1.72	1.55	1.57	1.41
Total Tangible Assets (millions of dollars)	10%	41	69	77	91	90
Total Tangible Equity (millions of dollars)	10%	19	30	32	34	33
Total Fixed Assets (millions of dollars)	10%	26	43	48	50	49
Total Land (millions of dollars)	15%	4.7	7.9	8.7	8.4	8.5
Total Debt (millions of dollars)	10%	23	39	51	59	54
Total Long Term Debt (millions of dollars)	10%	14	20	25	32	26
Total Short Term Debt (millions of dollars)	10%	3.2	5.2	5.8	5.8	7.2

Source: Foster D. Snell, Inc. Estimates Based on Industry Interviews and Corporate Financial Statements.

The firms with their main objective in treatment or disposal of hazardous waste had the following characteristics over the past five years:

- Net income has ranged between five percent and ten percent of revenues with 1971 as the most profitable year.
- In 1975, 17 percent of the companies surveyed were unprofitable. There was no relation between the size of the company and being unprofitable.
- Amount of working capital available in the industry has decreased over time and the current ratio has dropped from 1.77 to 1.28.
- In 1975, approximately 40 percent of the companies surveyed had working capital deficits. EPA Regions I, II and III had the greatest percentage of firms with profit and working capital problems.
- The asset turnover ratio (sales/total tangible assets) has averaged around 1.25 primarily because companies are keeping a low cash position and equipment expenditures have been kept to a minimum.
- The ratio of fixed assets to total assets has been approximately 0.6 with about one-fifth of fixed assets invested in land.
- The debt/equity ratio has increased substantially to 1.60 in 1974 and 1975 from approximately 1.2 in 1971 through 1973. The debt increase has been generated from increases in current liabilities as accounts payable. Long-term debt has not been available in 1975 and has decreased.
- The short term debt-to-equity ratio has been increasing from 0.15 in 1973 to 0.30 in 1975.

Table II-12 presents the key financial rates of firms whose main objective is in hazardous waste management.

TABLE II-12

FIVE YEAR HISTORY OF KEY FINANCIAL RATIOS OF FIRMS WHOSE MAIN OBJECTIVE IS HAZARDOUS WASTE MANAGEMENT

Ratio	1971	1972	1973	1974	1975
Net Income/Sales	0.104	0.053	0.065	0.069	0.080
Current Ratio	1.58	1.77	1.42	1.33	1.28
Working Capital (thousands of dollars per company)	$149	$177	$240	$74.9	$51.7
Tangible Assets/Sales	0.84	1.01	0.76	0.80	0.76
Profits/Tangible Assets	0.124	0.053	0.086	0.086	0.106
Tangible Net Worth/ Tangible Assets	0.45*	0.46	0.43	0.40	0.35
Fixed Assets/Total Assets	0.65	0.64	0.62	0.535	0.60
Land/Fixed Assets	0.19*	0.20*	0.20	0.173	0.17*
Total Debt/Equity	1.20*	1.19	1.18	1.60	1.64
Long Term Debt/Equity	0.71*	0.74	0.72	0.79	0.62*
Short Term Debt/Equity	0.17*	0.16	0.15	0.25	0.30
Working Capital/ Long Term Debt	-	0.43	0.71	0.20	0.21
Profits/Net Worth	-	0.115	0.20	0.215	0.30

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* Designates estimates based on 10% or less of total market.

Source: Foster D. Snell, Inc. Estimates Based on Industry Interviews and Corporate Financial Statements.

Large corporations who have divisions or sites engaged in hazardous waste management have maintained a relatively more stable financial picture from 1971 to 1975. To calculate the financial history of this segment of the industry, the following assumptions were used:

- A corporation's contribution to the industry was calculated only by its respective percentage of revenues that was generated from hazardous waste management.
- The financial structure of divisions or sites was assumed to be the same as the parent corporation (example: the financial ratios of Chem-Trol Division are that of SCA Services). A division's financial structure may not be exactly similar to the parent and has to be considered a limitation of the financial data. However, divisions of parent corporations obtain financing through the parent and its availability of capital would be dependent on the corporation's overall financial structure, not the division.

For firms with hazardous waste management divisions or sites, the following key characteristics over the past five years were:

- Net income remained fairly consistent at 5.0% to 6.5% of annual revenue.
- The corporations have established a positive working capital position with a current ratio approaching 2.0 in 1974 and 1975.
- Total tangible assets has remained approximately equal to sales revenues. The profits to tangible assets ratio has remained between 5% and 7.5%.
- Tangible net worth for the industry has remained stable at 40% of tangible assets. The ratio shows that as the corporation increases its assets, they maintain a consistent growth of net worth.
- Fixed assets are approximately 60% of total assets.

- Land is approximately 25% of financial assets.

- Short term debt has decreased as a ratio to equity from 0.20 in 1971 to 0.08 in 1975.

- Long term debt, however, had increased substantially until 1975 when a number of the leading firms in the industry made a corporate goal to decrease their debt/equity ratios.

Table II-13 presents a five year history of key financial ratios for corporations having hazardous waste management divisions or sites.

TABLE II-13

FIVE YEAR HISTORY OF KEY FINANCIAL RATIOS OF CORPORATIONS HAVING DIVISIONS OR SITES ENGAGED IN HAZARDOUS WASTE MANAGEMENT -- 1971-1975

Ratio	1971	1972	1973	1974	1975
Net Income/Sales	0.063	0.066	0.063	0.054	0.05*
Current Ratio	1.28	1.61	1.81	2.04	1.83
Working Capital (thousands of dollars)	$ 4,000*	7,300	11,430	15,031	14,000*
Tangible Assets/Sales	.85	1.07	1.13	1.08	1.03
Profits/Tangible Assets	0.074	0.062	0.056	0.050	0.049
Tangible Net Worth/ Tangible Assets	0.42	0.38	0.41	0.22	0.41
Fixed Assets/Total Assets	0.62	0.57	0.63	0.60	0.62
Land/Fixed Assets	0.14*	0.14*	0.14	0.15	0.15
Total Debt/Equity	1.37	1.66	2.43	1.96	1.59*
Long Term Debt/Equity	0.64	0.45	0.93	1.29	1.03
Short Term Debt/Equity	0.20	0.18	0.13	0.07	0.08
Working Capital/ Long Term Debt	-	0.72	0.36	0.34	0.31
Profits/Net Worth	0.175	0.163	0.136	0.15	0.12

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* Designates estimates based on less than 20% of total market.

Source: Foster D. Snell, Inc. Estimates Based on Industry Interviews and Corporate Financial Statements.

8. FACTORS AFFECTING CURRENT BUSINESS SUCCESS

The key factors that have had an impact on the success of firms within the hazardous waste management industry have been its accessibility to market demand and the cost of capital. This section of the report is segmented into four areas which discuss the characteristics of the current industry:

- Key factors affecting business success
- Factors having a major influence on business success
- Factors having a minor influence on business success
- Factors having no influence on business success.

8.1 Key Factors Affecting Business Success

The firms within the hazardous waste industry have the following characteristics which were a key influence on the potential success of the firms:

8.1.1 The Accessibility to Market Source

The total cost of hazardous waste disposal is dependent not only on a firm's waste processing costs, but also on the cost of transportation to the site, also an internal cost, if paid by the facility. Waste generators naturally go to the firms offering reliable service at the best price. It was found that the most profitable companies offering competitive services were geographically close to their major customers.

8.1.2 Cost of Capital

A firm's ability to obtain capital at a reasonable cost was a large factor in the determination of the firm's success. Thirty-one of the sites were subsidiaries or divisions of larger parent organizations which had accessibility to long term capital. The industry in general is young, and does not have an established reputation with private sources of debt financing. Hence, a number of the smaller firms have had to utilize short term financing, retained earnings, or maintain low cash positions in an effort to obtain necessary capital for expansion. They report these conditions have seriously affected their ability to expand.

8.2 Factors Having A Major Influence on the Business Success of the Firm

The firms within the hazardous wastes management industry had the following characteristics which were a major influence to the success of the firm.

8.2.1 Prevailing Municipal And State Regulations

The non-uniformity of the regulations and varying degrees of enforcement enable some firms to operate at lower costs than others. Examples of differing regulations include the allowable discharge limits for a state or municipality, permits for the ultimate disposal of hazardous chemicals to landfills that are less than secure, and the amount of "pressure" asserted by local enforcement agencies.

8.2.2 Siting Restraints

Obtaining the site permit in localities that are accessible to industry waste sources is a current problem. Industry interviews reported that localities and states have technical and other constraints which limit industrial expansion of hazardous waste management facilities.

8.2.3 Ability to Obtain Contracts With Large Industry Source

Almost all of the hazardous wastes handled are serviced on a contract basis. In general, the larger industrial firms which seek to maintain a good public image are disposing of their waste in a process approved by the local authorities. However, in most areas of the U.S., the industrial firms signing contracts with the "environmentally adequate" hazardous waste service industry do not deliver volumes of wastes that are anticipated from the contract. At present the most successful firms have contracts for handling wastes from large reliable sources.

8.2.4 Multiple Service Organizations

Firms that offered full service hazardous waste treatment and disposal service were more profitable than specialized operations. A facility apparently needs the capability of handling more than one industry's wastes. In addition, multiple service firms have an established reputation in most geographic areas. However, several instances were reported of firms which "over-built" and were not successful. The capital cost required for a full service facility was high; volume never approached capacity, and many multi-source facilities were unsuccessful.

8.2.5 Inexpensive Final Disposal Cost

The most successful facilities had access to or internally operated a relatively inexpensive source of final disposal; e.g. deep well injection, secure landfill, ocean disposal.

8.3 Factors Having a Minor Influence on the Business Success of the Firm

Interviewees in the hazardous waste management industry reported the following factors had a minor influence on the success of the firm. (For two specific firms, they were major factors.)

8.3.1 Competence of Professional Staff

The firms that were considered the leaders of the industry had staffs with strong technical backgrounds in chemical and waste management disciplines. This factor is not judged as major since a number of small firms had strong technical skills but were unable to obtain business.

8.3.2 Sales Force

Most successful firms maintain a sales force to obtain new business. However, some successful firms relied on their reputation, proximity to industry, or sales by operation supervisors.

8.3.3 Technological Innovation

The majority of the processes offered at various sites were technically the same, however some of the leading firms had a technical advantage over competition. Reduced operating costs or ability to handle a particular type of hazardous waste were the major technical advantages. Firms were able to reduce operating costs by a superior processing technology or offer multiple services where equipment and labor costs would be shared with other processes or departments within the firm.

8.3.4 Pricing

In-house treatment and disposal costs did vary between firms, however the overall cost of disposal to the generator is the prime cost factor of the industry. In the total treatment cost, the transportation cost is a major factor. A key pricing factor was, however, created by waste-to-waste processing versus use of virgin materials (e.g., blending of an acid and base for neutralization). In general, the larger firms have more opportunity for waste-to-waste processing.

8.3.5 Control of Labor Costs

The industry currently operates at low levels of capacity. It is labor intensive, and has seasonal fluctuations. To keep the operational costs of the firm competitive and the companies profitable, it is necessary to maintain a tight control on labor and maintenance costs.

8.3.6 Size of Firm

The larger firms in terms of sales and employment reported less regulatory agency pressure and had better opportunity to obtain long term financing.

8.3.7 Competition From Publicly Funded Sources

The following are examples of competition reported in interviews that were considered unfair to the private hazardous waste industry:

- Publicly funded landfills (as in California)
- Reduced enforcement of hazardous waste generators that are government or publicly owned.

8.3.8 Other Factors

Other factors that contributed to the success of some of the firms include:

- Utilization of inexpensive transportation, such as rail or barge
- Establishment and advertising of emergency spill units to aid industrial problems
- An on-site laboratory to perform analysis of incoming shipments and effluents.

8.4 Factors That Had Relatively No Influence on the Success of the Firm

- Accessibility to trained labor pool. (However, during the survey, the industry was not in a growth period and the time factor necessary to train personnel for various skill levels was not a problem).
- The establishment of a company-owned trucking fleet to service customers.
- The need for companies to offer solvent recovery operations.

* * * *

In summary, the hazardous waste management service industry is a new industry. Annual growth in the last five years has been 14 percent, capacity exceeds market demand and, with few exceptions, competition from environmentally inadequate but "approved" waste processors cannot be matched by the industry.

The survey shows that smaller firms in the industry can be profitable; however, large operations appear to have greater opportunities and resources for expansion. The following chapter examines the capabilities and needs of the industry to expand.

III. HAZARDOUS WASTE MANAGEMENT SERVICE INDUSTRY: GROWTH POTENTIAL

III. HAZARDOUS WASTE MANAGEMENT SERVICE INDUSTRY: GROWTH POTENTIAL

This chapter assesses the growth potential of the hazardous waste management industry. It projects current industry conditions into future periods, and includes an evaluation of key non-capital restraints.

The chapter's contents are as follows:

. 1 -- HAZARDOUS WASTE MANAGEMENT INDUSTRY DEMAND REQUIREMENTS

. 2 -- PROJECTED HAZARDOUS WASTE MANAGEMENT INDUSTRY CAPACITY

. 3 -- FINANCIAL DEMAND REQUIREMENTS

. 4 -- THE IMPACT AND IMPORTANCE OF NON-CAPITAL CONSTRAINTS ON DECISION TO EXPAND

1. HAZARDOUS WASTE MANAGEMENT INDUSTRY DEMAND REQUIREMENTS

Estimating the amount of hazardous waste that will be available in the future for treatment and disposal by the hazardous waste management industry is a two-part process. First, the total generation of hazardous waste in future periods must be projected. Then, an estimate of generator plant internal treatment and disposal quantities must be developed. To maintain a consistent data base, the Environmental Protection Agency's Hazardous Waste Management Division (HWMD) industry studies for 1974, 1977, and 1983 are used. This section is divided into two parts:

- Total projected industrial hazardous waste generation
- Projected demand for the hazardous waste management industry.

1.1 Industrial Hazardous Waste Generation in Future Periods

Based on the HWMD reports, the total industrial hazardous waste load is projected to increase (on a wet basis) by a 4.4 percent annual growth rate from 1974 to 1977. On a dry basis, between 1974 and 1977, the projected annual growth rate is 4.1 percent. From 1977 to 1983, the overall hazardous waste growth rates are: wet basis -- 2.0 percent annually; dry basis -- 2.6 percent annually.

To remain consistent with industrial hazardous waste studies contracted by the HWMD, the industrial hazardous waste estimates used by the contractor are in 13 industry groupings; these are:

- Primary and storage batteries
- Inorganic chemicals
- Organic chemicals, pesticides and explosives
- Electroplating
- Metals mining(1)
- Paint and allied products
- Petroleum refining
- Pharmaceuticals
- Primary metals, smelting and refining
- Textiles, dyeing, and finishing
- Rubber and plastics
- Leather tanning and finishing
- Special machinery

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(1) The metals mining industry does not use outside contractors for hazardous waste treatment and disposal, therefore is not included in the contractor's study.

Table III-1 presents the 1974 potentially hazardous waste quantities by industry category with projections for 1977 and 1983. This data must be considered a minimum because there are other potentially hazardous sources of wastes not covered in HWMD's industrial hazardous waste studies.

1.2 Industrial Hazardous Waste Available for Outside Contractors In Future Periods

Each of the EPA hazardous waste industry reports estimates the percentage of waste currently sent to outside contractors. These estimates were used in the contractor's analysis.

The estimated percentages of waste treated internally by producing firms is summarized in Table III-2.

For future period projections of hazardous waste available for outside contract, the same percentage of internally treated waste is utilized, except for petroleum industry practices which are projected to increase to 73% internal disposal by 1983.

Table III-3 presents the wet and dry projected industrial hazardous waste load available to outside contractors in 1977 and 1983. The hazardous waste load projections are divided by subtracting the amount of hazardous waste management performed internally from the total projected hazardous waste management load for each major industry. Table III-4 presents an estimate of the percent of regional distribution of these wastes. It is assumed that in any one EPA region, the percentage of wastes treated outside of the producers' facility will equal the national average.

In 1974 approximately 19 percent of the estimated hazardous wastes generated by the 13 industries (excluding metal mining) was available to outside contractors. In 1977 and 1983 the projected amounts of industrial hazardous waste available to outside contractors will decrease to 17 percent of hazardous waste generated.

TABLE III-1 (1)

INDUSTRIAL HAZARDOUS WASTE GROWTH PROJECTIONS
(Millions of Metric Tons per Year)

	1974		1977		1983	
Industry	Dry*	Wet*	Dry*	Wet*	Dry*	Wet*
Batteries(1)	0,005	0,010	0,082	0,164	0,105	0,209
Inorganic Chemicals(2)	2,000	3,400	2,300	3,900	2,800	4,800
Organic Chemicals, Pesticides, and Explosives(3)	2,150	6,860	3,500	11,666	3,800	12,666
Electroplating(4)	0,909	5,276	1,316	4,053	1,751	5,260
Paint and Allied Products(5)	0,075	0,096	0,084	0,110	0,105	0,145
Petroleum Refining(6)	0,610	1,300	0,647	1,400	0,693	1,500
Pharmaceuticals(7)	0,062	0,065	0,070	0,074	0,104	0,108
Primary Metals Smelting and Refining(8)	17,398	20,356	18,211	21,307	21,110	24,700
Rubber and Plastics(9)	0,206	0,786	0,243	0,945	0,300	1,205
Leather Tanning and Finishing(10)	0,045	0,146	0,050	0,148	0,068	0,214
Special Machinery(11)	0,102	0,163	0,094	0,153	0,157	0,210
Textile Mill Products(12)	0,048	1,770	0,050	1,870	0,179	0,680
TOTAL	23,611	40,228	26,647	45,785	31,172	51,697

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* "Dry" does not include weight of water; "wet" includes water weight.

Sources (on next page)

Sources With EPA Contract Numbers:

(1) Versar, Inc., "Assessment of Industrial Hazardous Waste Practices: Storage and Primary Battery Industries," Contract No. 68-01-2276.

(2) Versar, Inc., "Assessment of Industrial Hazardous Waste Practices, Inorganic Chemical Industry", Contract No. 68-01-2246.

(3) TRW Inc., "Assessment of Industrial Hazardous Waste Practices, Organic Chemicals, Pesticides, and Explosives Industries", Contract No. 68-01-2919.

(4) Battelle, Columbus Laboratories, "Assessment of Industrial Hazardous Waste Practices - Electroplating and Metal Finishing Industries", Contract No. 68-01-2664.

(5) Wapora Inc., "Assessment of Industrial Hazardous Waste Practices, Paints Industry", Contract No. 68-01-2656.

(6) Jacobs Engineering Co., "Assessment of Industrial Hazardous Waste Practices, Petroleum Refining", Contract No. 68-01-2288

(7) Arthur D. Little, Inc., "Hazardous Waste Generation, Treatment and Disposal in the Pharmaceutical Industry", Contract No. 68-01-2684.

(8) Calspan Corporation, "Assessment of Industrial Hazardous Waste Practices in the Metal Smelting and Refining Industry", Contract No. 68-01-2604.

(9) Foster D. Snell, Inc., "Assessment of Industrial Hazardous Waste Practices, Rubber and Plastics Industry", Contract No. 68-01-3194.

(10) SCS Engineers, Inc., "Assessment of Industrial Hazardous Waste Practices -- Leather Tanning and Finishing Industry", Contract No. 68-01-3261.

(11) Wapora Inc., "Assessment of Industrial Hazardous Waste Practices, Special Machinery and Manufacturing", EPA Contract No. 68-01-3193.

(12) Versar, Inc., "Assessment of Industrial Hazardous Waste Practices, Textiles Industry", Contract No. 68-01-3178.

TABLE III-2 (1)

PERCENT OF HAZARDOUS WASTE DISPOSED INTERNALLY BY PRODUCING FIRMS - 1974

Industry	Percent of Total Waste Internally Treated * And Disposed
Primary and Storage Batteries (1)	35%
Inorganic Chemicals (2)	85
Organic Chemicals, Pesticides and Explosives (3)	80
Electroplating (4)	30
Paint and Allied Products (5)	5
Petroleum Refining (6)	40
Pharmaceuticals (7)	15
Primary Metals Smelting and Refining (8)	98
Rubber (9)	5
Plastics (9)	80
Leather Tanning and Finishing (10)	5
Special Machinery (11)	5
Textiles, Dyeing, and Finishing (12)	94.5

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* All firms are assumed to dispose the same portion of waste internally in 1977 and 1983, as they do in 1974. Petroleum Refining is the exception, with internal disposal of wastes increasing to 73% in 1983.

Sources: (on next page)

TABLE III-2 (2)

Sources With EPA Contract Numbers:

(1) Versar, Inc., "Assessment of Industrial Hazardous Waste Practices: Storage and Primary Battery Industries," Contract No. 68-01-2276.

(2) Versar, Inc., "Assessment of Industrial Hazardous Waste Practices, Inorganic Chemical Industry", Contract No. 68-01-2246.

(3) TRW Inc., "Assessment of Industrial Hazardous Waste Practices, Organic Chemicals, Pesticides, and Explosives Industries", Contract No. 68-01-2919.

(4) Battelle, Columbus Laboratories, "Assessment of Industrial Hazardous Waste Practices - Electroplating and Metal Finishing Industries", Contract No. 68-01-2664.

(5) Wapora Inc., "Assessment of Industrial Hazardous Waste Practices, Paints Industry", Contract No. 68-01-2656.

(6) Jacobs Engineering Co., "Assessment of Industrial Hazardous Waste Practices, Petroleum Refining", Contract No. 68-01-2288

(7) Arthur D. Little, Inc., "Hazardous Waste Generation, Treatment and Disposal in the Pharmaceutical Industry", Contract No. 68-01-2684.

(8) Calspan Corporation, "Assessment of Industrial Hazardous Waste Practices in the Metal Smelting and Refining Industry", Contract No. 68-01-2604.

(9) Foster D. Snell, Inc., "Assessment of Industrial Hazardous Waste Practices, Rubber and Plastics Industry", Contract No. 68-01-3194.

(10) SCS Engineers, Inc., "Assessment of Industrial Hazardous Waste Practices -- Leather Tanning and Finishing Industry", Contract No. 68-01-3261.

(11) Wapora Inc., "Assessment of Industrial Hazardous Waste Practices, Special Machinery and Manufacturing", EPA Contract No. 68-01-3193.

(12) Versar, Inc., "Assessment of Industrial Hazardous Waste Practices, Textiles Industry", Contract No. 68-01-3178.

TABLE III-3

GROWTH PROJECTIONS OF INDUSTRIAL HAZARDOUS WASTE AVAILABLE FOR CONTRACT

	1974		1977		1983	
Industry	Dry	Wet	Dry	Wet	Dry	Wet
Batteries	0.003	0.006	0.053	0.107	0.068	0.139
Inorganic Chemicals	0.300	0.510	0.345	0.585	0.420	0.720
Organic Chemicals, Pesticides and Explosives	0.430	1.372	0.700	2.333	0.760	2.533
Electroplating	0.636	3.693	0.921	2.837	1.226	3.682
Paint and Allied Products	0.071	0.091	0.080	0.105	0.100	0.138
Petroleum Refining	0.366	0.780	0.390	0.840	0.186	0.405
Primary Metals Smelting & Refining	0.348	0.407	0.364	0.426	0.422	0.494
Leather Tanning and Finishing	0.043	0.139	0.048	0.136	0.065	0.203
Special Machinery	0.097	0.155	0.089	0.145	0.149	0.200
Textile Mill Products	0.012	0.098	0.012	0.103	0.018	0.045
Pharmaceuticals	0.053	0.055	0.060	0.063	0.088	0.092
Plastics	0.031	0.147	0.038	0.178	0.049	0.230
Rubber	0.046	0.046	0.049	0.049	0.051	0.051
	2.436	7.499	3.149	7.907	3.602	8.932

Source: Foster D. Snell, Inc. analysis.

TABLE III-4

DISTRIBUTION OF HAZARDOUS WASTE LOAD BY REGIONS
(Percent of Total Hazardous Waste per EPA Region)

	I	II	III	IV	V	VI	VII	VIII	IX	X
Batteries(1)	1.3	12.3	22.3	4.8	36.1	6.6	0.5	0	12.0	4.1
Inorganic Chemicals(2)	0.4	5.2	16.3	15.5	8.4	45.4	1.6	0	3.3	3.9
Organic Chemicals, Pesticides, Explosives(3)	0.1	3.6	15.0	21.5	2.8	54.6	0.9	0.1	1.2	0.2
Electroplating(4)	14.5	11.6	5.5	5.6	44.4	5.0	3.8	1.9	6.3	1.4
Paint and Allied Products(5)	2.2	15.5	9.2	13.9	31.6	6.5	5.9	0.6	13.3	1.3
Petroleum Refining(6)	0	4.9	7.2	3.4	18.0	43.1	3.5	3.8	13.1	3.0
Pharmaceuticals(7)	3.7	51.7	9.8	7.6	20.5	0.5	2.0	0	4.2	0
Primary Metals Smelting & Refining(8)	0.2	4.5	25.3	6.5	38.6	2.8	1.1	2.6	16.4	2.0
Rubber (9)	6.9	3.3	8.1	22.8	37.0	7.0	5.8	1.2	7.6	0.3
Plastics(9)	4.1	13.8	11.6	24.7	16.8	17.2	1.2	0.2	5.4	5.1
Leather Tanning & Finishing(10)	34.3	12.2	4.3	3.2	26.1	0.4	9.2	1.4	8.4	0.5
Special Machinery(11)	14.4	13.5	8.6	13.8	25.5	5.2	2.3	2.6	11.5	2.6
Textile Mill Products(12)	17.6	10.1	4.2	57.6	4.0	5.4	0.2	0.1	0.1	0.7
Weighted Average Available to Outside Contractors*	8.5	9.0	9.5	10.4	29.1	20.8	2.9	1.6	6.6	1.6

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* Weighted Average based on 1974 hazardous waste loads not internally treated by waste generators.

Sources: (see next page)

TABLE III-4 (2)

Sources With EPA Contract Numbers:

(1) Versar, Inc., "Assessment of Industrial Hazardous Waste Practices: Storage and Primary Battery Industries," Contract No. 68-01-2276.

(2) Versar, Inc., "Assessment of Industrial Hazardous Waste Practices, Inorganic Chemical Industry", Contract No. 68-01-2246.

(3) TRW Inc., "Assessment of Industrial Hazardous Waste Practices, Organic Chemicals, Pesticides, and Explosives Industries", Contract No. 68-01-2919.

(4) Battelle, Columbus Laboratories, "Assessment of Industrial Hazardous Waste Practices - Electroplating and Metal Finishing Industries", Contract No. 68-01-2664.

(5) Wapora Inc., "Assessment of Industrial Hazardous Waste Practices, Paints Industry", Contract No. 68-01-2656.

(6) Jacobs Engineering Co., "Assessment of Industrial Hazardous Waste Practices, Petroleum Refining", Contract No. 68-01-2288

(7) Arthur D. Little, Inc., "Hazardous Waste Generation, Treatment and Disposal in the Pharmaceutical Industry", Contract No. 68-01-2684.

(8) Calspan Corporation, "Assessment of Industrial Hazardous Waste Practices in the Metal Smelting and Refining Industry", Contract No. 68-01-2604.

(9) Foster D. Snell, Inc., "Assessment of Industrial Hazardous Waste Practices, Rubber and Plastics Industry", Contract No. 68-01-3194.

(10) SCS Engineers, Inc., "Assessment of Industrial Hazardous Waste Practices -- Leather Tanning and Finishing Industry", Contract No. 68-01-3261.

(11) Wapora Inc., "Assessment of Industrial Hazardous Waste Practices, Special Machinery and Manufacturing", EPA Contract No. 68-01-3193.

(12) Versar, Inc., "Assessment of Industrial Hazardous Waste Practices, Textiles Industry", Contract No. 68-01-3178.

2. PROJECTED HAZARDOUS WASTE MANAGEMENT INDUSTRY CAPACITY

Projected treatment and disposal capacity of the hazardous waste management industry is dependent on anticipated expansion plans, capital expenditures necessary for regulatory compliance, and elimination of environmentally inadequate disposal capacity.

In 1975 the industry was operating at approximately 50 percent of designed capacity. None of the companies interviewed reported facilities operating at designed capacity. In general, the industry capacity is being utilized four to five days per week on an eight hour a day basis. However, the industry, except for Region I, plans to increase the volume of hazardous waste treated or disposed by 1977. The industry plans to expand its operations by:

- Adding secure landfills, incineration, chemical fixation, deep well or resource recovery facilities at existing sites.
- Placing sites in other states.
- Developing and implementing new treatment methods.
- Adding storage, mixing and handling facilities.
- Adding sales personnel to cover new markets.
- Adding manpower to further utilize existing equipment.

The projected increase in volume of hazardous waste treated or disposed by the hazardous waste management industry in the 1975 to 1977 period, based on industry interviews, is presented in Table III-5. These projected increases are the average increase in volume handled as projected by hazardous waste management firms. These increases are not directly related to projected capacity in future periods. In the contractor's opinion, the projected capacity increases are a combined effect of enforcement of EPA regulations, future industrial waste loads, and compliance by industrial sources; all resulting in an increase in business for the hazardous waste management industry.

2.1 Capacity Expansion to 1977

From the expected increases in demand, all EPA regions except Regions I and VIII, are planning either new plants, new processes, additional sites, or additional equipment. Since the industry is currently utilizing only one-half its designed capacity, the increased projected volumes by the hazardous waste management industry in Table III-5 do not represent capacity additions.

TABLE III-5

HAZARDOUS WASTE MANAGEMENT INDUSTRY FORECASTED VOLUME INCREASE 1975-1977

EPA Region	Forecasted 1977 Industry Increase (percent increase of 1975 actual volumes)*
I	<5
II	20
III	25
IV	15
V	25
VI	25
VII	15
VIII	<5
IX	20
X	50

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* Hazardous waste management industry's forecasted increase of 1977 actual volume handled to 1975 actual volume.

Source: Foster D. Snell, Inc. industry interviews.

Capital expenditure plans by the industry include two types of action:

- Additions to maintain current capacity; for example, adding a scrubber to an incinerator in areas where air quality standards would force plant closing
- Addition of new facilities or equipment.

The impact of both these actions will increase the total amount of "environmentally adequate" capacity in 1977. Table III-6 presents a summary of the planned design capacity increases for the 1975 to 1977 period. Only one interviewee in the survey reported consideration of capacity increases after 1977, and the post-1977 plan was still in the market study stage. The lack of post-1977 planning was reported to be created by uncertain market conditions, and the reported claim of the industry that the existing capacity would have to be further utilized prior to new capital expenditures.

The 13 industry categories as identified by the HWMD are segregated into five market categories which have similar waste treatment and disposal methods as identified by industry interviews. (The classification of the 13 industries to five market categories is presented on Page 14).

The increased waste service capacity will primarily serve markets in the metal/metal finishing and organics (e.g., pesticides) industries. Table III-7 presents 1974 capacity by regional markets, planned capacity increases, and projected 1977 capacity. Capacity is reported on a wet basis to be consistent with study findings.

2.2 Environmentally Adequate Capacity, 1977

The EPA discourages the disposal of hazardous wastes by ocean dumping, and deep well injection (as well as disposal in non-secure landfills). Each of these methods is permissible under certain circumstances. For the purposes of this study, the capacity of firms disposing hazardous waste through either ocean dumping or deep well injection is subtracted from the projected hazardous waste treatment/disposal capacity figures.

Many firms have permits to dispose of hazardous wastes in unsecure landfills along with some proportion of conventional wastes. Although permitted by states and municipalities, EPA feels this technology is environmentally unacceptable unless the landfill is secure. Based on the interviews, approximately five landfills, outside of California, would meet secure landfill standards of the estimated 80 hazardous waste management industry landfills currently handling some form of potentially hazardous waste.

TABLE III-6

HAZARDOUS WASTE MANAGEMENT INDUSTRY FORECASTED CAPACITY INCREASE FOR 1975 TO 1977

EPA Region	Forecasted Capacity Increase (Percentage of 1975 Available Capacity)*
I	0%
II	10
III	20
IV	2.5
V	15
VI	12.5
VII	10
VIII	0
IX	5
X	20
U.S. Average:	9-11%

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* 1977 capacity in comparison to 1975 capacity.

Source: Foster D. Snell, Inc. estimates based on industry interviews.

TABLE III-7

REGIONAL HAZARDOUS WASTE MANAGEMENT CAPACITY FOR 1974 AND 1977 BY MARKET
(Millions of Metric Tons Per Year On a Wet Basis)

Region	Metals		Paints		Organics		Petroleum		Inorganics		Totals	
	1974	1977	1974	1977	1974	1977	1974	1977	1974	1977	1974	1977
I	-	-	0.008	0.008	0.004	0.004	0.005	0.005	0.052	0.052	0.069	0.069
II	0.072	0.072	0.225	0.230	0.112	0.155	0.020	0.025	0.108	0.108	0.537	0.590
III	0.125	0.185	0.046	0.046	0.015	0.024	0.031	0.031	0.130	0.130	0.347	0.416
IV	0.024	0.025	0.051	0.051	0.015	0.017	0.015	0.015	0.006	0.006	0.111	0.114
V	1.167	1.302	0.281	0.346	0.139	0.255	0.510	0.560	0.471	0.490	2.568	2.953
VI	0.067	0.100	0.036	0.052	0.026	0.075	1.108	1.174	0.074	0.074	1.311	1.475
VII	0.121	0.137	0.020	0.020	0.057	0.080	0.020	0.020	0.170	0.170	0.388	0.427
VIII	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.015	0.015
IX	0.089	0.106	0.031	0.039	0.084	0.086	0.764	0.781	0.191	0.195	1.149	1.207
X	0.053	0.105	0.051	0.068	0.056	0.108	0.561	0.597	0.062	0.062	0.783	0.940
TOTALS	1.721	2.035	0.752	0.863	0.501	0.807	3.037	3.211	1.267	1.290	7.278	8.206

Source: Foster D. Snell, Inc.

The effect on firms who landfill treated wastes cannot be determined at this time. The assumption is that if the firm "treats" the waste and then landfills it, the waste can be disposed in a landfill not meeting all the requirements of a secure landfill and, therefore, the waste capacity is not seriously affected by this limitation. Firms, however, that dispose of hazardous wastes directly into sanitary landfills will either have to stop the practice or ship the waste to an approved disposal site. The net effect may be an increase in business for a secure landfill firm and a decrease for non-secure landfill.

The most significant impact of environmentally inadequate capacity reductions occurs in the petroleum category (elimination of deep well disposal capacity) with a 44.2% drop in available capacity. Major waste load capacities are affected as follows:

.	Paint	2.8% drop in capacity
.	Metals	19.7% drop in capacity
.	Organics	21.2% drop in capacity
.	Petroleum	44.2% drop in capacity
.	Inorganic	2.4% drop in capacity

Paints are only marginally affected since a majority of these wastes are incinerated rather than being disposed in ocean or deep well sites. Metals are affected due to the elimination of deep well sites. High organics that may now be landfilled are affected significantly by restriction in siting. Inorganics are only affected to a minor degree by site restriction.

Capacities for 1975 and 1977 on a wet basis of hazardous waste management firms adjusted for the effects of ocean dumping, deep well injection and sanitary landfill elimination are presented in Table III-8.

TABLE III-8

ESTIMATED 1974 AND 1977 ENVIRONMENTALLY ADEQUATE HAZARDOUS WASTE MANAGEMENT CAPACITY (Millions of Metric Tons Per Year on a Wet Basis -- Less Deep Wells, Ocean Dumping and Sanitary Landfill)

Region	Metals		Paints		Organics		Petroleum		Inorganics		Total	
	1974	1977	1974	1977	1974	1977	1974	1977	1974	1977	1974	1977
I	-	-	0,006	0,006	0,003	0,003	0,005	0,005	0,040	0,040	0,054	0,054
II	0,066	0,066	0,211	0,216	0,105	0,148	0,020	0,025	0,096	0,096	0,498	0,551
III	0,104	0,164	0,046	0,046	0,008	0,017	0,031	0,031	0,121	0,121	0,310	0,379
IV	0,014	0,015	0,051	0,051	0,015	0,017	0,005	0,005	0,006	0,006	0,091	0,094
V	0,964	1,099	0,281	0,346	0,098	0,214	0,332	0,382	0,414	0,433	2,089	2,474
VI	0,042	0,075	0,032	0,048	0,020	0,069	0,281	0,347	0,054	0,054	0,429	0,593
VII	0,082	0,098	0,017	0,017	0,038	0,061	0,004	0,004	0,130	0,130	0,271	0,310
VIII	-	-	-	-	-	-	-	-	-	-	-	-
IX	0,065	0,082	0,031	0,039	0,057	0,069	0,457	0,474	0,157	0,161	0,767	0,825
X	0,046	0,098	0,051	0,068	0,051	0,103	0,561	0,597	0,057	0,057	0,766	0,923
TOTAL	1,383	1,697	0,726	0,837	0,395	0,701	1,696	1,870	1,075	1,098	5,275	6,203

Source: Foster D. Snell, Inc.

3. FINANCIAL DEMAND REQUIREMENTS

To meet the demand of waste load projections of 1977 and 1983 on outside hazardous waste management facilities, capital expansion is required. Assuming new Federal Regulation is imposed that will require treatment or disposal of all potentially hazardous wastes by 1983, then the demand of the hazardous waste management would be approximately 9 million metric wet tons of hazardous waste in 1983 (Table III-3). With the hazardous waste management industry operating at 50 percent of capacity, it handled approximately 3.7 million metric wet tons of hazardous waste in 1975. To almost triple the waste volume handled, the contractor estimates that the industry would need approximately 4,000 employees, including 460 professionals. This section presents the demand/supply analysis in three parts:

- Matching demand by region to capacity
- Capital construction needed by region to meet demand
- Lead time and capital constraints to growth

3.1 Demand/Capacity Relationships in 1977 and 1983

The estimated projections for demand by EPA region from types of waste as presented in Section 1 of this chapter, are utilized for the industrial demand in future periods. The industrial surveys which supplied the data base are completed; however, the estimates of demand discussed in this chapter are subject to change, since:

- The metals mining industry was entirely deleted from the study -- as outside contractors are not used for treatment or disposal of hazardous wastes
- The percentage of waste which is treated or disposed of externally by producing companies is large in many industries -- these industries may change their waste disposal practices in future periods to treat more internally.
- There are other industries besides the 13 identified by HWMD for study that are potentially hazardous waste generators.

The 13 industry categories as identified by the HWMD are segregated into five market categories which have similar waste treatment and disposal methods as identified by industry interviews.

Tables III-9 through III-13 present the capacity and demand of the hazardous waste management industry for each of the five market areas defined in 1974, 1977 and 1983 (the capacities used for 1977 and 1983 were only those being identified as environmentally adequate).

The 1983 capacity reported in Tables III-9 through III-13 are the same as 1977 capacity projections. The 1983 capacity was assumed to be equivalent to 1977 capacity for the purpose of calculated future financial demand requirements as:

- None of the firms interviewed by the contractor had any capital expansion plans after 1977 (the industry in general did not make capital expenditure projections past a two year projection).
- As there were no capital expenditure commitments after 1977, the financial demand requirements for the period 1977-1983 can be represented accurately by assuming 1977 as the base period.

Comparing demand with capacity provides estimates of hazardous waste management industry surplus or deficits on a regional basis. Analysts using these data are cautioned that inter-regional capacity/demand relationships are not recognized. That is, extreme deficits (or surpluses) in neighboring regions may be eliminated through cross regional flows.

Capacity deficiencies appear in the following market categories:

- Metals -- particularly electroplating hazardous wastes -- have insufficient treatment facilities in all regions except Region X.
- Organics -- pesticides and other organic hazardous waste treatment facilities have insufficient capacity in the major producing regions.

Sufficient environmentally acceptable capacity to meet demands was available in most regions for the paint, petroleum, and inorganic industry markets. Tables III-14 and III-15 present the regional capacity surpluses and deficits by EPA region for 1977 and 1983, respectively.

TABLE III-9

ESTIMATED HAZARDOUS WASTE MANAGEMENT INDUSTRY DEMAND AND CAPACITY -- METALS/ METALS FINISHING 1974, 1977 AND 1983

EPA	1974		1977		1983	
Region	Demand	Capacity	Demand	Capacity*	Demand	Capacity *
I	0.558	0.000	0.433	0.000	0.566	0.000
II	0.468	0.072	0.378	0.066	0.493	0.066
III	0.320	0.125	0.298	0.164	0.376	0.164
IV	0.254	0.024	0.216	0.015	0.274	0.015
V	1.840	1.167	1.505	1.099	1.927	1.099
VI	0.205	0.067	0.172	0.075	0.217	0.075
VII	0.148	0.121	0.116	0.098	0.150	0.098
VIII	0.085	0.003	0.068	0.000	0.087	0.000
IX	0.319	0.089	0.276	0.082	0.353	0.082
X	0.064	0.053	0.053	0.098	0.072	0.098
Total	4.261	1.721	3.515	1.697	4.515	1.697

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* Capacities used for 1977 and 1983 are considered environmentally adequate.

Source: Foster D. Snell, Inc. analysis.

TABLE III-10

ESTIMATED HAZARDOUS WASTE MANAGEMENT INDUSTRY DEMAND AND CAPACITY -- PAINTS/SOLVENTS/COATINGS

1974, 1977 AND 1983

(Millions of Metric Tons Per Year -- Wet Basis)

EPA	1974		1977		1983	
Region	Demand	Capacity	Demand	Capacity*	Demand	Capacity *
I	0.002	0.008	0.002	0.006	0.003	0.006
II	0.014	0.225	0.016	0.216	0.021	0.216
III	0.008	0.046	0.009	0.046	0.012	0.046
IV	0.013	0.051	0.015	0.051	0.020	0.051
V	0.030	0.281	0.035	0.346	0.045	0.346
VI	0.006	0.036	0.007	0.048	0.009	0.048
VII	0.005	0.020	0.006	0.017	0.008	0.017
VIII	0.000	0.003	0.000	--	0.000	--
IX	0.012	0.031	0.014	0.039	0.019	0.039
X	0.001	0.051	0.001	0.068	0.001	0.068
Total	0.091	0.752	0.105	0.837	0.138	0.837

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* Capacities used for 1977 and 1983 are considered environmentally adequate.

Source: Foster D. Snell, Inc.

TABLE III-11

ESTIMATED HAZARDOUS WASTE MANAGEMENT INDUSTRY DEMAND AND CAPACITY -- ORGANICS 1974, 1977 AND 1983

(Millions of Metric Tons Per Year -- Wet Basis)

EPA	1974		1977		1983	
Region	Demand	Capacity	Demand	Capacity *	Demand	Capacity *
I	0.029	0.004	0.031	0.003	0.025	0.003
II	0.110	0.112	0.158	0.148	0.177	0.148
III	0.237	0.015	0.387	0.017	0.422	0.017
IV	0.403	0.015	0.621	0.017	0.646	0.017
V	0.095	0.139	0.120	0.214	0.150	0.214
VI	0.784	0.026	1.320	0.069	1.429	0.069
VII	0.018	0.057	0.026	0.061	0.032	0.061
VIII	0.002	0.003	0.002	--	0.003	--
IX	0.029	0.074	0.044	0.069	0.050	0.069
X	0.011	0.056	0.017	0.103	0.017	0.103
Total	1.718	0.501	2.726	0.701	2.951	0.701

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* Capacities used for 1977 and 1983 are considered environmentally adequate.

Source: Foster D. Snell, Inc.

TABLE III-12

ESTIMATED HAZARDOUS WASTE MANAGEMENT INDUSTRY DEMAND AND CAPACITY -- PETROLEUM 1974 , 1977, AND 1983

(Millions of Metric Tons Per Year -- Wet Basis)

EPA	1974		1977		1983	
Region	Demand	Capacity	Demand	Capacity *	Demand	Capacity*
I	0.000	0.005	0.000	0.005	0.000	0.005
II	0.038	0.020	0.041	0.025	0.020	0.025
III	0.056	0.031	0.060	0.031	0.029	0.031
IV	0.027	0.015	0.029	0.005	0.014	0.005
V	0.140	0.510	0.151	0.382	0.073	0.382
VI	0.337	1.108	0.363	0.347	0.174	0.347
VII	0.027	0.020	0.029	0.004	0.014	0.004
VIII	0.030	0.003	0.032	--	0.016	--
IX	0.102	0.764	0.110	0.474	0.053	0.474
X	0.023	0.561	0.025	0.597	0.012	0.597
Total	0.780	3.037	0.840	1.870	0.405	1.870

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* Capacities used for 1977 and 1983 are considered environmentally adequate.

Source: Foster D. Snell, Inc.

TABLE III-13

ESTIMATED HAZARDOUS WASTE MANAGEMENT INDUSTRY DEMAND AND CAPACITY -- INORGANICS

1974, 1977 AND 1983

(Millions of Metric Tons Per Year -- Wet Basis)

EPA Region	1974		1977		1983	
	Demand	Capacity	Demand	Capacity*	Demand	Capacity*
I	0.050	0.052	0.049	0.04	0.073	0.040
II	0.044	0.108	0.048	0.096	0.063	0.096
III	0.089	0.130	0.101	0.121	0.126	0.121
IV	0.083	0.006	0.095	0.006	0.118	0.006
V	0.079	0.471	0.085	0.433	0.113	0.433
VI	0.231	0.074	0.265	0.054	0.327	0.054
VII	0.021	0.170	0.022	0.130	0.030	0.130
VIII	0.002	0.003	0.002	--	0.003	--
IX	0.029	0.191	0.031	0.161	0.041	0.161
X	0.021	0.062	0.023	0.05	0.029	0.057
Total	0.649	1.267	0.721	1.098	0.923	1.098

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* Capacities used for 1977 and 1983 are considered environmentally adequate.

Source: Foster D. Snell, Inc.

TABLE III-14

HAZARDOUS WASTE MANAGEMENT REGIONAL CAPACITY SURPLUSES (DEFICIT) TO DEMAND - 1977

(Millions of Wet Metric Tons Per Year)

Region	Metals	Paints	Organics	Petroleum	Inorganics
I	(0.433)	0.004	(0.028)	0.005	(0.009)
II	(0.312)	0.200	(0.010)	(0.016)	0.048
III	(0.134)	0.037	(0.370)	(0.029)	0.020
IV	(0.201)	0.036	(0.604)	(0.024)	(0.089)
V	(0.406)	0.311	0.094	0.231	0.348
VI	(0.097)	0.041	(1.251)	(0.016)	(0.211)
VII	(0.018)	0.011	0.035	(0.025)	0.108
VIII	(0.068)	0.000	(0.002)	(0.032)	(0.002)
IX	(0.194)	0.025	0.025	0.364	0.130
X	0.045	0.067	0.086	0.572	0.034
Total	(1.818)	0.732	(2.025)	1.030	0.377

Source: Foster D. Snell, Inc.

TABLE III-15

HAZARDOUS WASTE MANAGEMENT REGIONAL CAPACITY SURPLUS (DEFICIT) TO DEMAND - 1983
(Millions of Wet Metric Tons Per Year)

Region	Metals	Paints	Organics	Petroleum	Inorganics
I	(0.566)	0.003	(0.022)	0.005	(0.033)
II	(0.427)	0.195	(0.029)	0.005	0.033
III	(0.212)	0.034	(0.405)	0.002	(0.005)
IV	(0.259)	0.031	(0.629)	(0.009)	(0.112)
V	(0.828)	0.301	0.064	0.309	0.320
VI	(0.142)	0.039	(1.360)	0.173	(0.273)
VII	(0.052)	0.009	0.029	(0.010)	0.100
VIII	(0.087)	0.000	(0.003)	(0.016)	(0.003)
IX	(0.271)	0.020	0.019	.421	0.120
X	0.026	0.067	0.086	.585	0.028
Total	(2.818)	0.699	(2.250)	1.465	0.175

Source: Foster D. Snell, Inc.

3.2 Capital Expenditure For Capacity

To meet the demand of future periods, capital expenditures for new facilities are necessary. It is assumed that demand has to be met on a regional basis for the nine regions which may be capacity deficient in 1983. This section presents the estimated capital expenditures necessary to meet demand on a regional basis in 1983.

The capital costs used for plants are based on EPA estimates and modified by industry interviews. The contractor assumes no plant is larger than 1,000,000 gallons per day of aqueous treatment or 607 tons per day of incineration.

The capital cost estimates for various types and sizes of facilities are presented in Figures III-1 and III-2. The plants can be scaled within the range shown by these preliminary cost estimates.

3.3 Capital Expenditure Requirements for 1983

To meet the demand requirements of the hazardous waste management industry in 1983, capital expenditure estimates were required in addition to the projected capacity increases of the industry to 1977. Since there was relatively no data available on anticipated capacity increases after 1977, the contractor calculated the capital expenditures that would be necessary by the hazardous waste industry from 1977's capacity to 1983 demand. In this manner, the total expenditures necessary for the six year period can be estimated to meet the capacity requirement necessary for 1983 projected demand. The following assumptions were used to calculate capital requirements for 1983 :

- Capacity has to be met on a regional basis. Interregional capacity/demand relationships are not recognized as the cost of transportation to treat or dispose of a hazardous waste is a major factor in the overall cost of hazardous waste management.

- The capital cost of transportation equipment (e.g., hazardous waste management industry owned trucks) is not included.

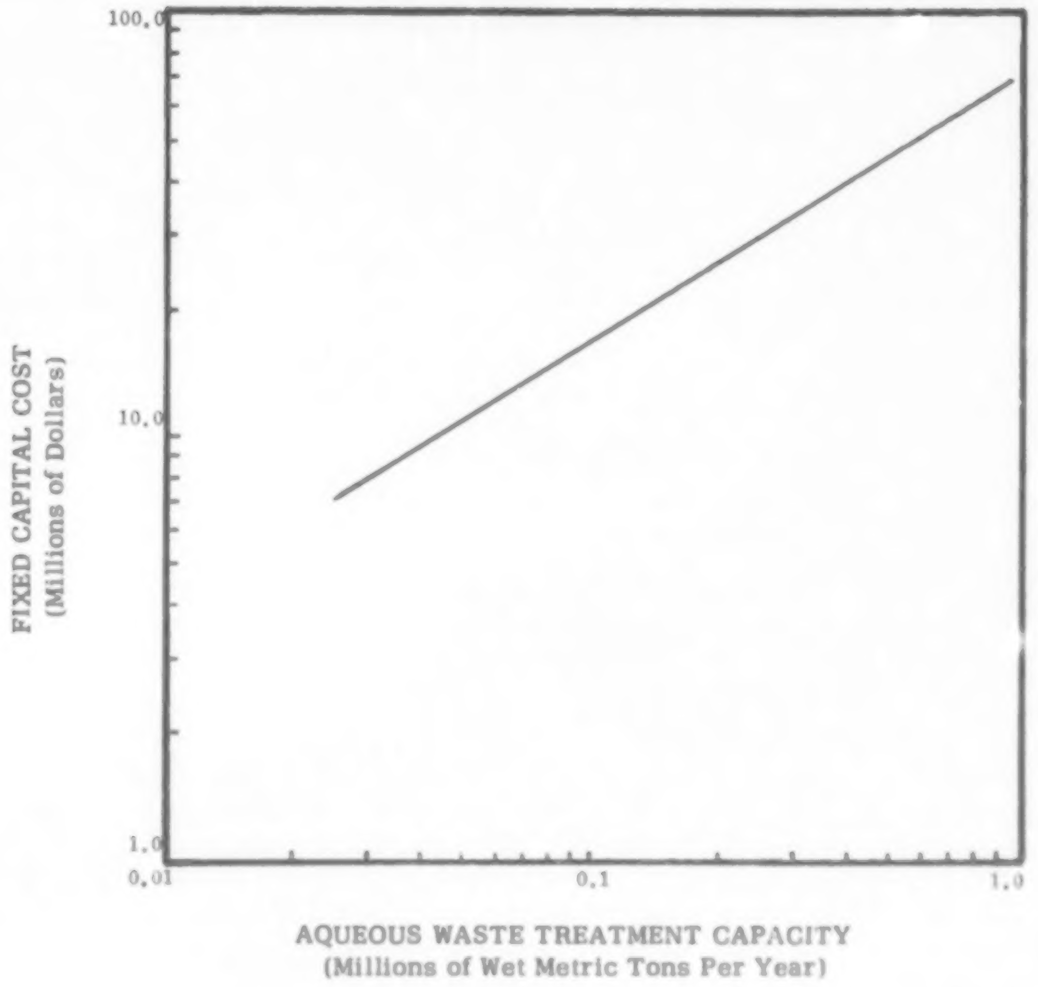
- No inclusion of capital expenditures necessary by the industry to maintain existing facility capacity.

- Existing technology of waste treatment processes and disposal.

FIGURE III-1

CAPITAL COST OF WASTE TREATMENT FACILITY

AQUEOUS

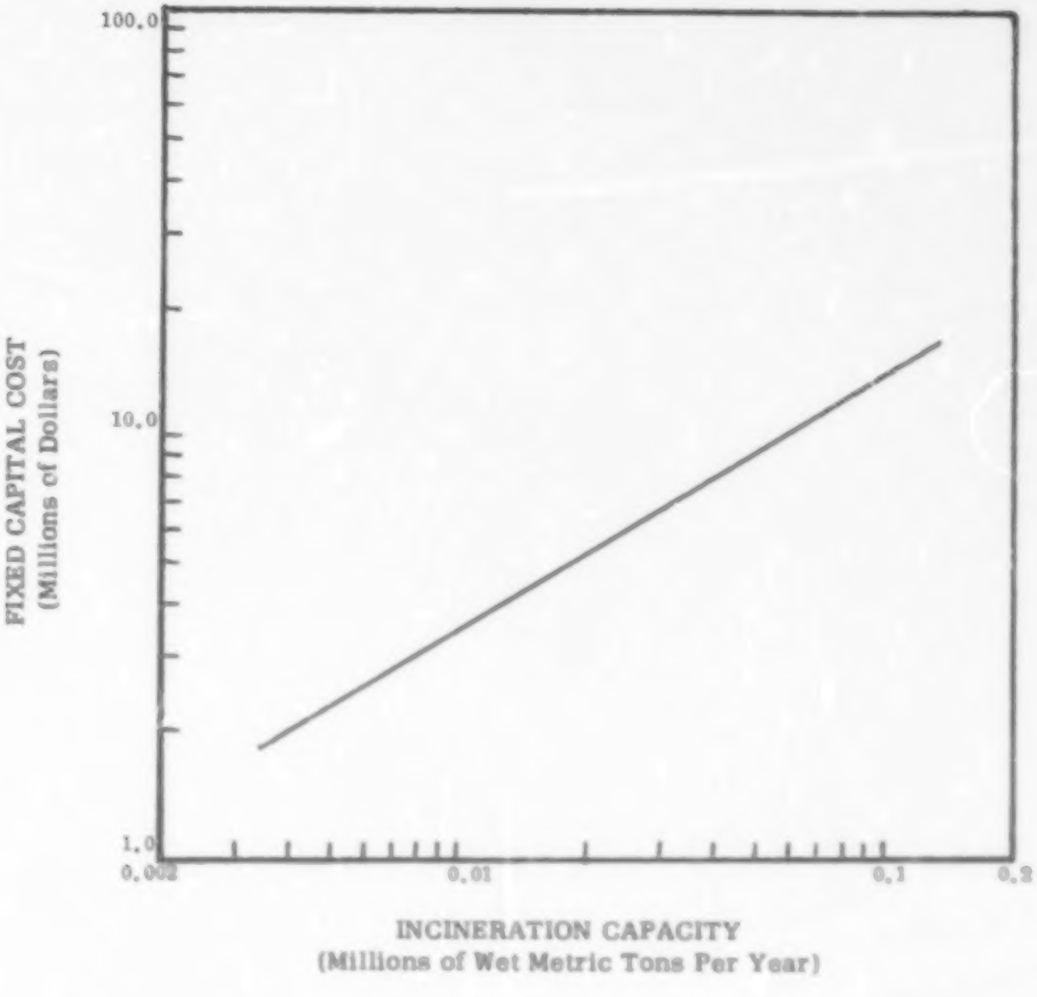


Source: Swift, W.H. Program for the management of hazardous wastes. v.1. (Richland, Wash.), Battelle Memorial Institute. Mar. 1, 1973. July, 1973. 385 p.

FIGURE III-2

CAPITAL COST OF WASTE TREATMENT FACILITY

INCINERATION



Source: Swift, W.H. Program for the management of hazardous wastes. v.1. (Richland, Wash.), Battelle Memorial Institute, Mar. 1, 1973. July, 1973. 385 p.

To meet the demand requirements of 1983 an estimated $570 million will have to be invested in capital expenditures beyond 1977's hazardous waste management capacity projections. The $570 million expenditure is the estimated cost of completely new facilities. However, approximately 40% of the interviewees indicated that facilities at their present location would and could be expanded to meet capacity requirements. In most cases, existing facilities would be adequate to serve doubled capacity at full utilization; for example, laboratories are currently used only 10% to 20% of the time and would not require duplication. In addition, the practice of the industry is to use second-hand equipment as much as possible.

Industry representatives estimated that an estimated 20% to 30% savings could result from expanding in current locations and use of used versus new equipment. As a result, the contractor estimates that the cost to the industry to increase capacity to meet 1983 demands would be approximately $400 million. Upgrading of current capacity to meet new environmental standards is estimated to cost $100 million.

Table III-16 presents the capital requirements necessary to meet 1983 demand by EPA region with national totals.

3.4 Lead Time For New Capacity

Industry representatives claim that the following lead times for installation of hazardous waste management facilities after site approval are required:

- Aqueous treatment -- 6 to 12 months for batch process; and up to 2 years for continuous processing
- Incineration -- 12 to 24 months

Site approval is estimated to require from six months to two years and is dependent on the market and municipality (or state) need for the facility.

The contractor considers these estimates valid since recent installations have been constructed within these limits. In addition, the technologies are known.

TABLE III-16

HAZARDOUS WASTE MANAGEMENT INDUSTRY ESTIMATED CAPITAL REQUIREMENTS TO MEET 1983 FORECASTED DEMAND*

(Millions of Dollars)

Region	Aqueous Waste Treatment	Incineration	Total
I	$ 51.4	$ 4.4	$ 55.8
II	39.9	-	39.9
III	27.9	48.2	76.1
IV	38.5	79.2	117.7
V	46.5	-	46.5
VI	41.2	147.2	188.4
VII	-	-	-
VIII	16.4	5.3	21.7
IX	22.4	-	22.4
X	-	-	-
Total	$ 284.2	$284.3	$ 568.5

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*Capital Requirements do not include capital investments forecast by industry to generate 1977 capacity.

Source: Foster D. Snell, Inc.

On-the-job training techniques now being used may delay the employee growth of the industry to the projected demands of 4,000 employees in 1983, but it was not estimated to be a problem by the majority of companies interviewed. As a result of expansion, industry representatives estimate new facilities may not be able to reach designed capacity until six months to one year after installation.

3.5 Capital Constraints to Growth

The majority of the companies interviewed reported that reduced capital availability was a key deterrent to expansion. In many cases, the poor capital availability resulted from the capital structure of the business. The practice of using short term debt for leveraging low equity levels increases the risk of bank financing. In addition, low utilization of capacity reduces cash inflow, while the high fixed costs continue. As a result, the industry was characterized by several respondents as operating at minimum and risky cost flow positions. until enforcement was increased. For those organizations where capital availability was not a critical problem, such as the large conglomerates, the interviewees reported similar disinterest in significant investment until hazardous waste regulation is increased.

Approximately 80 percent of the interviewees reported that if hazardous waste management regulation is increased and enforced -- including prohibition of existing sanitary landfill and open dumping -- capital availability problems would be substantially reduced.

3.6 Industry Growth Assuming Static Conditions

The hazardous waste management industry has grown over the past five years. The sales (hazardous waste revenues) growth rate has been 14 percent annually since 1971 (Section II-7). Capacity is forecast to increase at approximately 5 percent per year to 1977 (Table III-6: 9-11% increase from 1975 to 1977 period).

Assuming that the real growth of the hazardous waste management industry has been 8 percent annually (6 percent annual price increases) and projecting 1975 hazardous waste volumes to 1983 - the industry would handle approximately 6.7 million wet metric tons per year of hazardous waste in 1983. If environmentally adequate capacity expanded at a 5 percent annual growth rate from 1977 to 1983, the industry would have approximately 8.3 million wet metric tons per year of environmentally adequate capacity.

The projected volume and capacity data reflect that the industry would be operating at approximately 80 percent of capacity in 1983.

4. THE IMPACT AND IMPORTANCE OF NON-CAPITAL CONSTRAINTS ON DECISION TO EXPAND

All of the companies contacted had one or more non-capital constraints on their ability or desire to expand. This section presents the comments related to longer range business projections.

The major constraint was the degree of enforcement of regulations, which represents a problem to over 70 percent of the companies. The constraint ranges from total lack of enforcement to non-uniform enforcement on the waste producers. In effect, the hazardous waste management industry's market is not required to treat wastes in an environmentally adequate manner. Problems were also cited in differences between state and local regulations within states and differences between states. This constraint was most prevalent in Regions I, II, IV, VII and X, without any clear cut distinction between type of company or size.

Competitive pressures are affecting 44 percent of the companies adversely. Companies in the waste treatment segment of the industry complained about landfills that receive public funding as unfair competition. Companies also felt that the cost of their service to a waste producer was a "fringe" that could be eliminated at any time by the producer who didn't care where the waste went. This constraint was most pronounced in Regions I, II, III and IV, representing the Northeast, Mid-Atlantic and border states, without any clear cut distinction on company size.

Siting is a constraint to 42 percent of the companies. This factor takes the form of opposition to either obtaining new sites or expanding old ones. Public opposition to "garbage dumps" or "chemical plants" has stopped many companies from considering expansion. This constraint tends to be more of a problem in less industrialized regions, such as IV, VI, VII, IX and X.

Other regulations affect expansion plans in 30 percent of the cases. Companies having incinerators must meet clean air standards. Companies treating acid and caustic wastes cannot dispose of the neutral salt due to water control standards. Regions I, IV, VII and X, have the highest concentration of companies having difficulty.

Manpower availability represented a significant problem to only 15 percent of the interviewees. Obtaining and keeping trained personnel, both laborers and management, was a constraint; primarily in Regions I and V.

Approximately 10 percent of the companies interviewed forecast technological development and expansion within the industry to be a problem in future periods. Availability of equipment to meet the market needs is uncertain, and the rapidly escalating cost of equipment and installation is a financial problem. Alternative investments were minor constraints.

Other constraints evinced significant comment from respondees as representing problems. One or more of the following constraints were mentioned as a problem in 65 percent of the companies interviewed:

- Concern over governmental agencies entering the business in competition with private industry, such as municipal landfills or publicly funded projects.
- Tendency for major waste producers to treat their own wastes, either for economic reasons or to gain public image for instituting environmental programs.
- Trend in waste producing industry to eliminate products that generate hazardous waste, i.e., water-based paints instead of solvent-based, plastic not metal parts.
- Trend in waste producing industry to recover, re-use, or recycle products that were once either treated efficaciously or dumped; this change is due to the cost of raw materials versus disposal costs.
- Enforcement of regulations is more stringent on hazardous waste management companies than on waste producers.
- Federal government, particularly the military, are widespread and prolific disposers of hazardous wastes in non-efficacious manner, leading to the establishment of double standards for government and private industry.
- Non-uniformity of language, and interpretation of hazardous waste regulations from all levels of government leading waste producers to "cheapest and easiest" method of hazardous waste disposal.
- Lack of public awareness of problems, potential solutions, and benefits, public only sees "bad side".

IV. DISCUSSION

IV. DISCUSSION

This chapter presents the results from the survey of the hazardous waste management service industry. These results regarding growth and industry structure, are presented in two sections to illustrate the range of possible futures for the industry, that is, with and without new Federal, state and local hazardous waste regulation and enforcement. Conclusions regarding the impact of these alternatives on the operations and services of the industry are also included. The key conclusions are summarized in a Table at the end of the chapter. The conclusions focused on the 1975 to 1983 time period, since these dates represent milestones for existing air and water regulations.

For each of the regulation options, the following factors are examined:

- Industry demand and growth rate
- Industry structure
    - Number of companies and ownership
    - Number of facilities
- Operations
- Employment
- Asset requirements
- Capital and other constraints to growth
- Revenues
- Prices

1. PROJECTED HAZARDOUS WASTE MANAGEMENT INDUSTRY GROWTH WITH NO NEW FEDERAL, STATE AND LOCAL REGULATION

All of the respondents interviewed expect increased hazardous waste regulation and enforcement by 1983. They based this forecast on the known provisions of the clean air and water acts and the increasing interest in industrial waste disposal by state and local authorities.

1.1 Industry Demand/Growth Rate

At best, the impact of the above regulations on the industry is forecast to continue existing trends in demand and industry growth. Current growth rates are approximately five percent per year in capacity with a slightly higher (6% to 8%) increase in the volume of wastes treated and disposed. Factors, such as the volume of wastes treated internally, limit the capacity growth to approximately 5 percent per year. At a growth rate of 5 percent with no regulation, the industry is projected to have 8.3 million metric tons per year (wet basis) environmentally adequate capacity in 1983 (6.2 million of metric tons capacity in 1977, Table III-8).

1.2 Industry Structure

Currently, the hazardous waste management industry is in an over capacity situation utilizing approximately 53 percent of capacity nationwide. The result of this condition is a number of facilities which are marginally profitable or losing money. In contrast, other operations are earning attractive profits. Both types of businesses are viewed as acquisition candidates by the large solid waste conglomerates -- selected marginal firms are attractive because of locations, permits and established customers, and the profitable firms because of the established position and profits.

Essentially, the hazardous waste management industry is in a "shake out" period in terms of ownership. Without new Federal state or local regulation and enforcement, industry representatives forecast 10 to 20 of the marginally profitable companies will either be acquired or go out of business because of a lack of financial resources. Since approximately 17 percent of the companies are currently unprofitable, the estimate appears valid.

Only one to two new company entrants in the market are forecast over the next five years and these are small specialized facilities. However, stronger organizations expect to expand; the net expansion is forecasted by industry representatives to be four to five facilities per year.

The 1980 to 1983 industry structure is therefore forecasted to be 75 to 85 organizations operating 130 to 140 facilities. Since the larger firms expect to acquire some currently marginally profitable organizations and install new facilities, by 1980 to 1983 four to five organizations should dominate the market and be responsible for approximately 50 percent of the volume treated.

1.3 Operations

Potential alternatives for waste producers also serve to constrain hazardous waste management industry capacity growth to the current 5 percent per year average; these include

- Increased processing of hazardous wastes by producers -- particularly if generators are held liable for damage or injury resulting from hazardous waste treatment or disposal
- Removal of hazardous substances from production operations.

In any case, the number of small (one to 10 drums) lots is expected to increase. Although the practice to process small quantities exists now, the hazardous waste management industry's response has been to aggregate the hazardous waste in a collection tank which is left on the waste producer's site and periodically collect the wastes.

In addition, without new Federal, state or local regulation, processing operations should continue to use existing technology and types of equipment. The technology is known, equipment applied is generally environmentally adequate, and in many cases, the equipment requires little first cost investment. For example, aqueous treatment can be conducted in lagoon batch processing operations with the only on-site capital cost item being excavation, pond liners and pumps. These low budget systems have costs of less than $100,000 per site and are capable of treating up to two million gallons per year. The capital estimates in earlier chapters show that sophisticated continuous systems have capital costs that are orders of magnitude above the low budget systems. However, the continuous systems normally incorporate some form of lagoon treatment, so the low budget systems can be upgraded to improve environmental adequacy and capacity as the market develops.

1.4 Employment

Because of the current underutilization of capacity, the majority of interviewees forecast the volume of wastes currently treated and disposed could be doubled with an average 30 percent increase in labor. Four companies provided estimates to illustrate this claim, and the estimate was judged valid by the contractor. As a result, with a 60 percent volume increase to 8.3 million metric tons per year forecast of waste treated and disposed (without regulation), the number of employees in the industry by 1983 is estimated as 2,600 including approximately 260 professionals.

1.5 Assets

To support a 5 percent capacity growth rate, the assets of the industry must be increased by approximately $60 to $70 million (1975 dollars) by 1983. This estimate includes the costs of maintaining capacity and depreciation. The spending rate is approximately $20 to $25 million per year with the current 10 percent depreciation rate. The total 1975 to 1983 capital outlay with no regulation is approximately $200 to $250 million.

1.6 Capital and Other Constraints to Growth

Four of the larger companies interviewed reported capital spending rates of over $1 million per year on new hazardous waste management facilities. In addition, over the past five years, the industry assets have increased by approximately $10 million per year, even though the financial structure of many of the companies was poor. Therefore, the contractor estimates that the industry can continue to support capital expenditures of $20 to $25 million annually. Increased utilization should provide up to 20 percent of the needed capital and the existing patterns of using short and some long-term debt will continue. Continued use of short-term debt is forecast because of the reluctance of banks and other investors to supply long-term debt. Since the profits of the business are attractive in some instances, short term debt -- including personal loans -- is the only alternative, and a low risk option for smaller firms.

With respect to non-capital constraints, the major issue is the degree of enforcement of regulations. This issue was discussed earlier; the forecast is for a gradual increase in enforcement, creating a 6 percent to 8 percent annual volumetric demand increase. The key issue then becomes facility siting, which interviewees reported is increasingly difficult. Industry responses to siting questions during the survey varied as follows:

- 40 percent of the interviewees reported siting difficulties (permits, licenses, etc.) -- primarily confined to North-Atlantic states.

- 60 percent of the interviewees reported that siting was not a problem -- in three cases local governments assisted siting since the communities wanted a hazardous waste management facility to service local industries.

Since relatively few new sites will be required (four to five per year) without new Federal, state or local regulation, the contractor forecasts that siting will not be a significant problem except in the North-Atlantic regions.

1.7 Revenues

At the projected growth rates, revenue of the industry should increase at a rate slightly lower than the volumetric demand growth rate or approximately 5 percent per year. The use of currently underutilized capacity will permit growth in revenue and profit without corresponding increases in costs. Pressures to remain competitive will limit price increases (discussed in the following section) and have the effect of increasing revenue at the slightly lower rate than volumetric throughput would indicate. The result by 1983 is that the industry will have estimated revenues of $150 to $160 million (1975 dollars), if no new regulation is imposed.

1.8 Prices

Virtually all of the interviewees reported competition from low priced operations which simply collect and deposit hazardous wastes in dumps, sanitary landfills or other locations. The result of this competition is a difficulty in raising prices and a tendency to maintain prices as a function of operational costs. Without new hazardous waste management regulations, competition from low-cost operations is expected to only gradually decrease. The net effect is forecast to be strict control on costs and strong pressure not to increase prices in the hazardous waste management industry. Forecasts of price increases are, therefore, primarily related to increased costs of labor, materials and equipment. In general, interviewees anticipated 5 percent to 10 percent annual increases in these areas which would be reflected in slightly lower annual hazardous waste management service price increases of approximately 5 percent per year.

* * * *

In summary, without new Federal, state or local regulations, the hazardous waste management industry expects continuation of current business patterns at least through 1983. In general, a capacity growth rate of only 5 percent per year is forecast. Because of marginal profitability 10 to 20 percent of the hazardous waste treatment and disposal organizations are expected to be acquired or go out of business in the 1975-1983 period. However, stronger, currently profitable companies expect to expand. The net result forecast by the contractor is that by 1980 to 1983, 75 to 85 companies will be operating 130 to 140 facilities. The larger organizations, which have better access to capital sources, are also expected to assume greater control of the industry. Prices in the industry are forecast to increase at 5 percent per year, reflecting both anticipated general inflation and the pressure of competition acting to maintain price levels.

2. PROJECTED HAZARDOUS WASTE MANAGEMENT INDUSTRY GROWTH WITH NEW FEDERAL, STATE AND/OR LOCAL REGULATION

This section assesses the potential of the hazardous waste management industry to expand in response to new hazardous waste regulation. For the purpose of this assessment, the following assumptions were used:

- Legislation requiring environmentally adequate treatment and disposal of hazardous wastes is enacted and vigorously enforced in 1977.
- Demand for "environmentally adequate" hazardous waste services increases to handle approximately 9 million wet metric tons of hazardous waste in 1983. (Projected waste load from Table III-3).
- The cost of providing new facilities is approximately $570 million from 1977 to 1983.
- A phased implementation schedule.

In the survey, all of the respondents were questioned regarding the ability of the industry to meet a requirement for doubling or tripling capacity by 1983. The majority of respondents did not believe any regulation would have such a significant impact in this time period since:

- U.S. industry would oppose rapid implementation of regulation which would divert significant resources from production capacity increases to non-productive work.
- Guidelines and standards would require time for formulation
- Enforcement activities would have to be increased and personnel are not being trained.
- Siting approval delays construction and operation of hazardous waste management service facilities.

Industry comments regarding a requirement to increase capacity focused on the scheduled timing of enforcement, and types of equipment required. All the interviewees reported that aggressive, impartial enforcement was mandatory.

The lead times required to double capacity will have a substantial impact on the ability of the hazardous waste management industry to respond to the demand. In the majority of interviews, some form of phased implementation was desired by the interviewees to minimize growth problems and reduce costs. Consequently, a phased program of implementation was assumed to reduce supply/demand problems and enable the industry to bring capacity on stream. The assumed steps in a new hazardous waste regulation are shown in Table IV-1. Basically, the legislation/regulation enactment was assumed for 1977, and the full implementation assumed by 1983 to coincide with clean water regulations.

2.1 Estimated Industry Demand/Growth Rate

Analysis of the demand on the hazardous waste management industry, presented in Table III-15 of this report, identified a net U.S. deficit of approximately 5 million metric tons of waste on a wet basis capacity per year by 1983 with demand being met on a regional basis. To meet this demand by 1983, the current environmentally adequate industry must essentially double capacity from 1975 to 1983. (Although 1975 to 1983 is an eight year period, only six years are estimated as relevant, assuming regulations are not adopted until 1977.) For the purposes of this report, approximately 10 percent excess capacity in the industry was assumed. As a result, current capacity must be increased by 100 percent by 1983 to over 12 million metric tons per year. Since current utilization is approximately 50 percent of capacity, throughput must increase by 350 percent. These total estimates require a 12 percent annual capacity growth and a 22 percent annual growth in throughput from 1977 to 1983. Three firms in the industry interviewed for this study are currently growing at these rates without significant difficulty. However, the ability of the industry to meet this requirement is subject to various constraints which are discussed in the following paragraphs.

2.2 Industry Structure

Hazardous waste management industry representatives expected the current industry "shake out" to continue regardless of regulation. Operators of profitable firms attributed the failing financial conditions of marginal operations to poor management, as well as poor markets. Examples of poor management included over-building, particularly with new high cost components, inadequate sales efforts, poor targeting of customers to permit waste-to-waste treatment; over-staffing, etc. The majority of interviewees reported, however, that new regulation would enable more companies to stay in business and create business conditions which would attract new entrants. The net result forecast by the contractor is relative stability in the overall number of firms or 90 to 100 companies by 1983.

TABLE IV-1

ASSUMED PHASED SCHEDULE FOR IMPLEMENTATION OF HAZARDOUS WASTE LEGISLATION AND REGULATION

Year	Actions
1975 to 1977	Development of legislation and regulatory standards.
1977 to 1979	Passage of legislation and regulations at federal and state levels to: . Identify hazardous waste streams . Establish standards for environmental quality and contamination by hazardous waste streams . Begin implementation of standards.
1979	Implement standards for environmental quality, for example,banning open dumping or disposal in sanitary landfills.
1979 to 1983	Enforcement of standards.
1983	National compliance with standards.

Source: Foster D. Snell, Inc. based on industry interviews.

Although a 100 percent increase in capacity is estimated as required, it would not be reflected in a corresponding increase in the number of facilities. Approximately 40 percent of the interviewees reported that existing sites were adequate for more than 100 percent increase in capacity. The number of new sites and facilities required is essentially a trade-off between the economics of scale of larger facilities and the costs of transportation. In most cases facilities can and do service a state-wide area. Based on the 1983 demand by region, the contractor estimates that to reach the assumed required capacity, approximately 50 to 60 additional sites will be required. The estimate also includes approximately 20 secure landfills. These sites will be larger than those estimated for growth with no regulation and in most cases will offer both chemical treatment and incineration. The location of the new sites is forecast to be in the deficit regions shown in Table III-15.

Although the number of companies is forecast to remain relatively constant, the dominance of larger companies in the industry is forecast to increase. Industry representatives reported that capital availability for the smaller firms is a deterrent to expansion. These firms would need to demonstrate one to two years of good earnings potential to even attract the knowledgeable investor. However, the larger firms or subsidiaries have the means for faster capital formation and can lead the market. As a result, with new regulation, four to five large companies should gain an increased market share.

2.3 Operations

The primary impact of new regulation will be on operations. Throughputs are forecast to increase to near capacity levels, and new equipment must be designed, ordered, installed and placed on stream. However, as with the conditions of no regulation, hazardous waste management industry representatives report they would adopt a "wait and see" attitude since:

- Internal treatment by waste producers may increase
- Hazardous substances may be removed from production processes
- The industry presently has sufficient waste treatment/disposal capacity.

Since larger waste producers are expected to continue the current trend to concentrate hazardous wastes into small lots, the number of small lots is expected to increase, similar to the case of no regulation.

Two options exist for processing equipment to increase environmentally adequate capacity by 1983; these include:

- Sophisticated chemical treatment and disposal facilities at an industry-wide cost of approximately $780 million, including:
  - New environmentally adequate facilities with capacity to meet forecasted demand -- $570 million .
  - New environmentally adequate facilities with capacity to provide for 10% excess capacity -- $110 million .
  - Upgrading of existing capacity to meet new regulatory standards -- $100 million.
- Maximum use of existing facilities and continued utilization of used but serviceable equipment at an estimated industry-wide cost of $610 million, including:
  - Environmentally adequate facilities with capacity to meet forecasted demand -- $425 million.
  - Environmentally adequate facilities with capacity to provide for 10% excess capacity -- $85 million.
  - Upgrading of existing capacity to meet new regulatory standards -- $100 million .

A more detailed discussion of these costs was presented earlier. The costs are also discussed in Section 2.5 and 2.6 which follow. Industry representatives consider it unlikely that all current practices will prove environmentally adequate under the scrutiny of new hazardous waste regulation and upgrading will be required. In addition, because of the marginal profit experiences of existing companies which have installed sophisticated equipment, representatives of the industry do not forecast installation of complex chemical treatment equipment. Consequently, a compromise treatment/disposal method is forecast which is adaptable to higher technology if business conditions warrant, but in any case provides environmentally adequate treatment. That is, the industry will probably select the lower cost option outlined above.

The impact of this decision would have negligible impact on the technology of operations. However, the impact of increased throughput is forecast to have substantial impact on the business aspects of hazardous waste treatment operations. At high capacity utilization, flexibility is limited, for example:

- Storage facilities may be limited because of costs, therefore wastes may not be economically stored for long periods to take advantage of waste-to-waste conversion
- Production scheduling is required
- Maintenance must be scheduled
- Downtime is expensive

In short, the problems are similar to those faced in any production industry -- the chemical industry is a good example.

The ability of small firms in the hazardous waste management industry to manage operations under these conditions is doubtful. The problems currently associated with poor management, such as over-building, inaccurate market judgment, etc., lead to the conclusion that the overall management of operations must be improved.

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2.4 Employment

Current hazardous waste management industry employment is approximately 2,000 persons, including 230 professionals. The contractor estimates that at a maximum, to increase capacity by 100 percent and improve operations, the number of industry employees must increase by a factor of two. The net result is an industry that employs approximately 4,000 persons, including 450 professionals.

Of even greater importance are the management skills required to manage and operate plants operating at high utilization levels. A requirement will also exist for skilled technicians. Personnel with these skills are available in the chemical process industry, but must be recruited and trained in hazardous waste management.

The six months to one year time required to recruit and train employees also points to the need for the phasing of implementation of new hazardous waste regulation.

2.5 Assets

To support the increase in environmentally adequate hazardous waste management, industry capacity estimated expenditures range from $610 to $770 million. These have been discussed in earlier sections. The most likely response, based on industry interviews, is at the low end of the range. This corresponds to an investment of approximately $100 million per year by the industry or four times the current spending rate.

2.6 Capital and Other Constraints to Growth

The hazardous waste management industry currently has capital availability problems. Since individual company expenditures are small, the current investment is supported by short term debt, including delay of payments to suppliers and even personal loans to proprietors. The ability of the industry to increase current capital spending by four times or more is doubtful.

Based on the industry interviews, the following scenario is forecast:

- From 1975 to 1977, the industry will continue to grow at current 5 percent annual rates.

- In 1977 new hazardous waste regulation may be adopted by federal, state and local government

- From 1977 to 1979, all companies will utilize existing capacity to meet demand.

  - After one or more years of improved earnings, larger companies will begin to invest in the industry.

  - After one to two years of improved earnings, the well managed smaller firms should use improved balance sheets to seek new investment capital.

- From 1979 to 1983, based on markets, the larger companies should begin site construction and operation --

  - Existing sites will be expanded in one to two years

  - New sites will require up to three years for site approval and construction.

- During the 1979 to 1983 period, the smaller firms will also begin seeking capital and site approvals and plant construction.

None of the companies interviewed believed the profitable firms could support an industry-wide 100 percent increase in capacity because of lack of available markets and restrictions on capital. At best, an annual spending rate of $40 to $50 million annually over the 1977 to 1983 period is forecast for the larger corporations. The ability of the smaller concerns to invest is limited by the need to demonstrate earnings potential and is forecast to be approximately $10 million per year over the 1979 to 1983 period. Consequently, the contractor estimates that the industry will only be able to support a maximum of $400 million of the $610 million required or 66 percent of the estimated requirement to meet demand and provide some excess. Assuming $100 million is used to upgrade existing capacity and the remainder for additional capacity, the 1983 capacity of the industry under these conditions is estimated at 9.1 million metric tons wet of 80 percent of total U.S. demand. Table IV-2 illustrates demand and capacity estimates.

However, other sources for additional funding exist, as well as options for ownership of treatment processes. Waste producers and local or state organizations may support the additional expenditures. In addition, existing federal small business loan programs could be used. The ability and willingness of these organizations to support industry growth is beyond the scope of the survey, but several interviewees reported existing relationships which provide similar assistance. Furthermore, if waste generators are faced with the inability to dispose of hazardous waste to hazardous waste management firms, the only option is internal management of wastes. The majority of interviewees expected internal treatment to expand, since the cost of treating for one or two compounds in a waste stream by plant is normally less than the cost of treatment in a general purpose facility.

With respect to other constraints, siting will be a problem. However, the industry expects any new regulation to have provisions requiring the establishment of sites. Employment is not forecasted as a problem if the regulations are phased.

As a result, the contractor forecasts that the environmental adequacy of hazardous waste treatment will not be a problem under new Federal, state or local regulation; however, waste generators may have to assume up to a 10 to 20 percent greater burden of treatment than currently expected. The hazardous waste service industry should be able to serve approximately 75 to 85 percent of the demand by 1983, if the new regulations are aggressively enforced.

2.7 Revenues

At the projected growth rates, and considering the impact of capital restraints, the industry revenues are estimated to increase by a factor of three (1975 dollars) by 1983. Greater utilization of capacity is reported to be the chief factor in maintaining, and even decreasing prices in some instances. Up to a 50 percent price differential was reported in the survey between plants operating near capacity, and those operating at low (30 percent to 50 percent) utilization levels. As a result, in 1975 dollars, revenues of the industry by 1983 are estimated to range from $330 to $350 million. The impact of an assumed 5 percent general inflation (that is the same revenues expressed in 1983 dollars) is estimated to increase these annual revenues to $460 to $500 million.

2.8 Prices

The majority of interviewees reported on the increased efficiencies of greater capacity utilization. This factor is forecast to permit price stability in the market (in terms of 1975 dollars) as utilization is increased. However, general inflation, particularly resulting from higher costs of skilled labor and equipment, are expected to impact on prices. Based on a combination of the above factors, the contractor estimates that the net result will be general price increases of approximately 5 percent annually.

* * * *

The estimated growth of the hazardous waste management industry, with and without new Federal regulation, is summarized in Table IV-2. Figure IV-1 summarizes the capacity/demand relationships of the U.S. hazardous waste management industry from 1974 to 1983 assuming constant annual growth rates with and without new Federal regulation.

TABLE IV-2

ESTIMATED STRUCTURE OF THE HAZARDOUS WASTE MANAGEMENT INDUSTRY IN 1983, WITH AND WITHOUT NEW FEDERAL, STATE OR LOCAL REGULATION

Item	Without Regulation	With Regulation
U.S. Demand(1) (million metric tons per year wet(2))	4.5	8.9
Number of Companies	75 to 85	90 to 100
Number of Facilities	130 to 140	160 to 170
Capacity Required to Meet Demand on an EPA Regional Basis (million metric tons per year -- wet)	5	11 (12 with 10% excess)
Forecasted Capacity by EPA Regional Basis (million metric tons per year -- wet)	8.3	9.1
Revenues (1975 dollars in millions)	$150 to $160	$330 to $350
Employment (number)	2,100	4,500
Tangible Assets (dollars in millions)	$150	$400 to $500
Key Assumptions		
Annual Capacity Growth Rate: 1977-1983	5%	12% (to reach 12 million metric tons per year)
Regulation	Patchwork, state or local standards for hazardous waste control.	Phased, nationwide Federal, state or local regulation on hazardous wastes.

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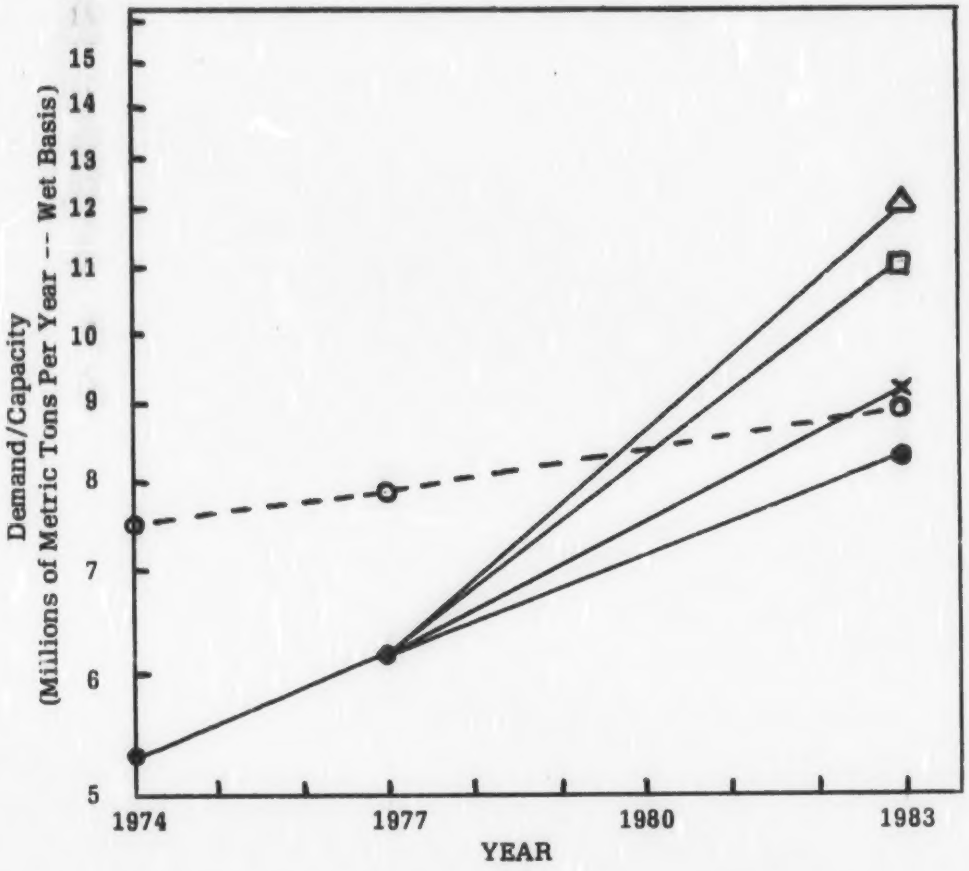
(1) Quantity of wastes available for treatment and disposal

(2) Includes water weight

Source: Foster D. Snell, Inc.

FIGURE IV-1

U.S. HAZARDOUS WASTE MANAGEMENT INDUSTRY DEMAND/CAPACITY PROJECTIONS TO 1983



Key:

- ○ Demand -- Amount of Hazardous Waste Available to Outside Contractors
- □ Environmentally Adequate Capacity Necessary to Meet 1983 Hazardous Waste Load Demand (1983) On A Regional Basis
- △ Environmentally Adequate Capacity Necessary To Meet 1983 Hazardous Waste Load Demand (1983) On A Regional Basis Assuming 10 Percent Excess
- ● Forecasted Environmentally Adequate Capacity Without Regulation (5 Percent Annual Growth Rate)
- × Forecasted Environmentally Adequate Capacity With Regulation

Source: Foster D. Snell, Inc. analysis.

APPENDIX A

GLOSSARY

APPENDIX A

GLOSSARY

Biological Treatment	A treatment process in which biologically active growths in the presence of oxygen feed on organic wastes.
Chemical Treatment	Any of the following processes used to treat hazardous wastes: neutralization, reduction, precipitation, oxidation, calcination, ion exchange, evaporation, ammonia stripping, flocculation or settling.
Deep Well Disposal	A system of disposing of filtered hazardous waste into deep wells where it is contained in the pores of permeable subsurface rock separated from other ground water supplies by impermeable layers of rock or clay.
Disposal Site	Location where any final deposition of waste occurs.
Environmentally Adequate	Does not cause any substantial present or potential hazard to human health or the environment.
Hazardous Waste	Any waste or combination of wastes which pose a substantial present or potential hazard to human health or the environment because such waste or wastes are non-degradable or persistent in nature; can be biologically magnified; can be lethal; or may otherwise cause or tend to cause detrimental and cumulative effects.
Ocean Dumping	Process of utilizing the ocean as the ultimate disposal sink for all types of waste materials.
Secure Landfill	A landfill handling wastes that meets the guidelines of California's Class I definition of a landfill.

APPENDIX B

INTERVIEW GUIDE

OMB No. 158S75016

DATA ACQUISITION FORM

For

EPA Contract No. 68-01-3266

Potential For Capacity Creation Of Hazardous Waste Treatment And Disposal Industry

Foster D. Snell, Inc. is conducting this survey to provide a data base regarding the current and future availability of environmentally adequate hazardous waste treatment and disposal facilities. The survey includes:

- Documenting the current industry structure.
- An assessment of the industry's ability to expand to meet the requirements of new control standards.

The assessment includes evaluation of capital and non-capital constraints to growth, such as industry-client marketing practices, competition and siting problems.

The Snell Program Manager for this study is:

Foster D. Snell, Inc.
Hanover Road
Florham Park, New Jersey 07932
(201) 377-6700

Name/Title of Contact ______________________________

Company Address/Phone Number: ______________________________
(indicate parent or owner if
company is a subsidiary) ______________________________

____

Snell Interviewer ______________________________ Date ____________

Visit ____________ Phone Interview ____________

1. DESCRIPTION OF AVAILABLE PROCESSES

(1) Plant Location and Age (Denote additions and age)

(2) Obtain Services Offered (Obtain a flow diagram if available and indicate what wastes and processes are used by the facility for resource recovery -- define if capacity is wet or dry basis).

Service (Process)	Waste Treated Capacity (1)	Current Utilization (%)	Remarks
Collection and Transport			
Receiving/Storage			
Neutralization			
Biological			
Precipitation			
Chemical Fixation			
Oxidation-Reduction			
Flocculation-Sedimentation			
Filtration/Ultra Filtration			
Ammonia Stripping			
Carbon Sorption (indicate who regenerates carbon)			
Incineration			
Evaporation			
Landfill (indicate location and type)			
Resource Recovery			
Deep Well Injection			
Other			

---

(1) Identify if capacity and utilization is on a one or two shift basis, five or seven days per week, etc.

(3) Discuss problems with fuel/energy availability, particularly for incineration.

(4) Air Pollution Control (Equipment, problems, etc.)

(5) Water Pollution Control (Equipment, problems, etc.)

(6) Discuss state or local license requirements and problems.

2. EMPLOYMENT

Obtain the following facility employment data, segment professionals, such as chemists, industrial engineers, etc., from other skills. Identify management background, such as chemistry or engineering.

Number of Employees:

Skill Levels:

Labor Organizations:

Average Wage and Fringes:

Productivity Measurement:

(Example: gallons/day/employee)

3. MARKETS AND SALES

(1) Tabulate Sales Breakdown and Geographic Range of Markets:

Type Of Customer Or Market	Wastes Treated (Refused)	Quantity Treated (lb. or gal.)	Processes Used(1)	Price Of Service(2)	Sales ($)

---

(1) Use terms shown in Process Description section, such as Collection and Transport, Neutralization, etc.

(2) Define how prices are determined.

(2) Discuss the typical sale of your service (i.e. sales call, customer call, lab analysis, etc.).

(3) Discuss the likelihood of price changes in the future (obtain reason for change) and estimate the effect of the change on demand and supply of services. Ask about the impact of general business conditions on prices.

4. COST CHARACTERISTICS

(1) Discuss a Typical Revenue Distribution for the Facility (estimates, not proprietary data are desired and fixed versus variable costs should be identified)

Item	Percent of Sales	Historical Increase Decrease in Past 5 Years (percent per year)
Sales	100%	
Expenses		
Material		
Energy		
Labor		
Transportation		
Selling		
G&A		
Site Fees		
Interest		
. Vehicles		
. Other equipment		
Profit before tax		
Tax		
Profit after tax		

(2) Discuss the Following Financial Indicators:

Investment ($): Plant $ __________, Working Capital $ __________

Short term versus long term debt:

Market values of assets:

Ownership configurations:

Availability of credit: (if poor, obtain reason)

(3) Discuss cash flows:

5. POTENTIAL FOR EXPANSION

(1) Discuss the services (processes) required for this plant to serve industry in this area when standards such as water effluent guidelines are imposed. Identify how the company would go about expanding.

Market and Waste	Service Required	Capacity Required[a]	Cost Of Capacity[b]		Lead Time
			Capital	Operating	

(a) For process equipment with "optimum" economies of scale -- indicate when required.

(b) Current price and price when required per lb. or gal.

(2) Discuss your Employee Requirements (number, skills, etc.) for Expanded Facilities:

(3) Discuss the Impact of a Proposed Expansion on the Following Factors:

Item	Impact
Capital Requirements and Availability	
Sales ($ and volume)	
Pricing	
Cost Characteristics	
Financial Indicators	

(4) Discuss the Impact and Importance of the Following Non-Capital Constraints on Your Decision to Expand Capacity.

Constraint	Comments
Competitive (captive and non-captive as it affects ease of entry)	
Potential Technological Advances	
Manpower and/or Skill Availability	
Siting (availability and public opposition)	

(4) (continued)

Constraint	Comments
Degree of Enforcement of Regulation	
Impact of Other Environmental Programs, Particularly Those Regulating Hazardous Wastes	
Alternative Investments	
Inflationary Practices	
Other	

6. DISCUSS IF INTERVIEWEE RECOMMENDS OTHER KEY INDUSTRY INFORMATION SOURCES

APPENDIX C

LIST OF INTERVIEWS BY EPA REGION

APPENDIX C (1)

LIST OF INTERVIEWS BY EPA REGION

Region 1

The Crago Company, ME
Eastern Smelting and Refining, MA
Silresim Chemical Corporation, MA (1)
Montvale Laboratories, MA
Ventron Corporation, MA
S.C.A. Services, Inc., MA

Region 2

Recycling Laboratories, NY
Chem-Trol Pollution Services, Inc., NY (1)
Chemical Waste Disposal Corporation, NY
Frontier Chemical Waste Process, Inc., NY
Pollution Abatement Services, NY
Mercury Refining Company, Inc., NY
Chemical Control Corporation, NJ (1)
Marisol, Inc., NJ
National Converters, Inc., NJ
Scientific, Inc., NJ
Modern Transportation Company, NJ
Princeton Disposal Services, NJ
Scientific Chemical Processing, Inc., NJ
Gaess Environmental Services, NJ

Region 3

American Recovery Corporation, PA
Chemfix, PA
Sitkin Metal Industries, Inc., PA
New Jersery Zinc, PA (1)
U.S. Utilities Service Corporation, PA
Liquid Waste Disposal of Virginia, VA
Rollins Environmental Services, DE

Region 4

Liquid Waste Disposal, Inc., KY (1)
Destructo-Chemway, NC (1)
Wasteplex, Inc., TN (1)
Lanham Waste Control, (B.F.I. subsidiary), GA
Industrial Pollution Control, Ky. (2)

APPENDIX C (2)

LIST OF INTERVIEWS BY EPA REGION

Region 5

Industrial Liquid Waste Disposal, IN (1)
American Chemical Service, IN
Seymour Manufacturing, IN
American Recovery Corporation, IN
Kaski Construction Company, OH
Chem-Dyne Corporation, OH (1)
Systems Technology Corporation, OH
Erieway Pollution Control, OH
Ohio Liquid Disposal, Inc., OH (1)
Browning-Ferris of Ohio, Inc., OH
Waste Research and Reclamation Company, Inc., WI
Rodgers Laboratories, WI
Hyon Waste Management Services, Inc., IL
Interstate Pollution Control, IL
Simmons Refining, IL
B.F.I. Chemical Services Division, IL
Pollution Controls Corporation, MN
Approved Chemical Treatment, MI
Environmental Waste Control, Inc., MI (1)
Liquid Disposal Company, MI
Prenco, MI
Chem-Met Services, MI
Nelson Chemicals, MI

Region 6

Browning-Ferris Industries, Inc., TX (2)
Malone Service Company, TX
Bioecology Systems, Inc., TX
Texas Ecologists, Inc., TX
Texas Liquid Waste Disposal Company, TX
Petrolite Corporation, TX (1)
U.S. Pollution Control, Inc., OK

Region 7

Conservation Chemical Company, MO (1)
Findett Corporation, MO
Wheeling Disposal Services, MO

Region 8

Denver Waste Disposal (Denver Cleanup), CO

APPENDIX C (3)

LIST OF INTERVIEWS BY EPA REGION

Region 9

Casmalia Disposal Site, CA
Environmental Protection Corporation, CA (1)
Industrial Tank Company, CA (1)
Omar Rendering Company, CA
Los Angeles County, CA (1)
Ventura County Department of Public Works, CA
Nuclear Engineering Company, Inc., CA
Liquid Waste Management, CA
Roberts Liquid Disposal, CA
Richmond Sanitary Services, CA
Edgington Oil Refinery, CA
Superior Oil Company, CA
Chancellor-Ogden, Inc., CA (1)

Region 10

Wescon, Inc., ID (1)
Chemical Processors, Inc., WA (1)
Resource Recovery Corporation, WA

Other

National Solid Waste Management Assoc., D.C. (2)

Notes:
(1) Personal Visit to Facility
(2) Visited Through Corporate Headquarters

Source: Foster D. Snell, Inc.

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